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THE WELDING ENGINEER

AUGUST, 1948

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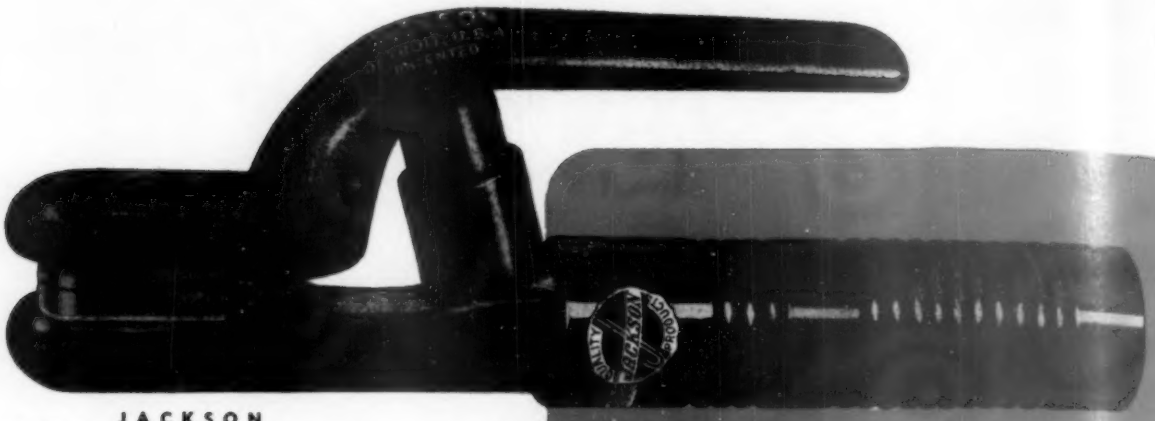

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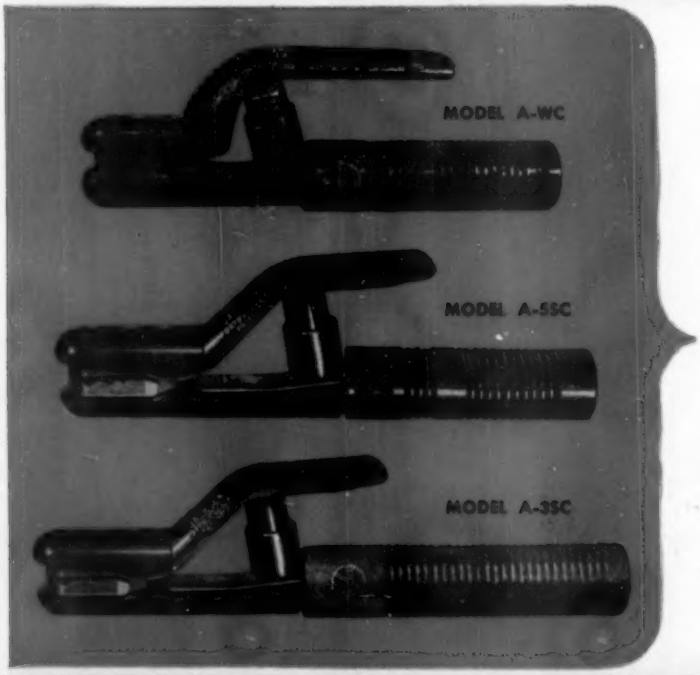

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THE WELDING ENGINEER

ESTABLISHED 1916 AUGUST, 1948

Not on the Drawing

"WHY DOES WELDING cost so much?" new users often inquire. It is easy to blame the weldors. Too many weldors, unfortunately, do appear reluctant to do a dollar's worth of work for a dollar's worth of wages. That, however, is only part of the story.

Management itself has helped to boost the cost of welding. Many plants have been reluctant to engineer welding as they do the designs employing other means of fastening. Yet, when told that part of the high cost of welding is "because you are not engineering your welding job," one management indignantly exclaimed, "Why we have a *large* engineering department—over 10% of our employees are engineers!" Perhaps that is true. Nevertheless that particular management should not brag about its engineering department, for it isn't doing the job.

The blueprints come from that engineering department with weld joints indicated by a line. An arrow points to that line, and at the end of the arrow is a notation which reads, "Weld." All of the plant's engineering drawings indicate their welded joints with no more than a simple one-word command.

When such a drawing hits the shop, who does the engineering—who designs the weld joint? Not the engineer—he's passed the buck to the weldor on the job, and what does the weldor know about welding design? Very little, unless he is an unusual fellow, and in that case he would be better serving his employer in the engineering department. However, the weldor has no choice in the matter. Since the engineers have left it up to him, he is compelled to use his best judgment. If his guess is inadequate, as it sometimes is, the job probably will have to be done over. Naturally, the cost is increased. If he plays it safe, as is usually the case, he deposits too much weld metal. That also boosts the cost of welding.

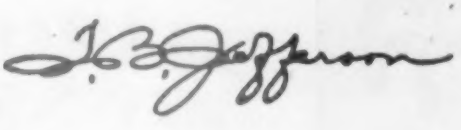
Are engineers being paid merely to draw lines and write "Weld"? No! They are to do a real job of figuring the stresses in the joint and specifying the proper size of weld that is adequate to meet them.

Situations in which the design is put up to the weldor, his foreman or even the shop superintendent not only prove costly in time and money, but are often costly in company morale. The shop men naturally wonder why they have to do the engineers' job. These difficulties could be avoided if the engineers would only devote a little study and consideration to designing the product for welding. It's easy enough to figure the stresses that will be developed in a structure so that the proper size of weld bead can be indicated on the drawing.

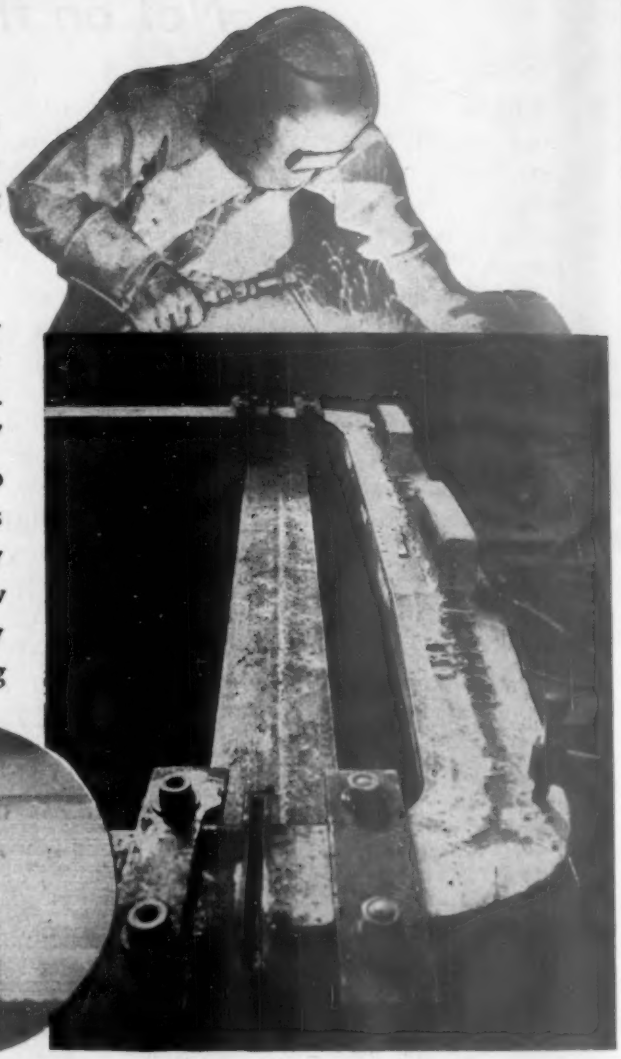
The American Welding Society has devised welding symbols—a shorthand system for engineers—that can be used to tell the complete welding story easily and quickly. These symbols make it possible to designate where the weld should be, the type of weld and its size. They may even go so far as to give information with regard to the technique and welding materials to be employed. The engineer's job in welded design isn't too hard—always provided that he *is* an engineer.

Welding symbols were first adopted in this country in 1929, yet 19 years later there are all too many organizations who merely write "Weld" on their blueprints and let the shop do all the engineering. If the shop is to engineer the job, possibly part of the shop time should be charged to Engineering Overhead. This would materially decrease the cost of welding, but as a solution it is not recommended.

Let the shop men do the welding and the engineers do the engineering. A less costly product, more durable and of lighter weight, possibly more pleasing to the eye, will result.



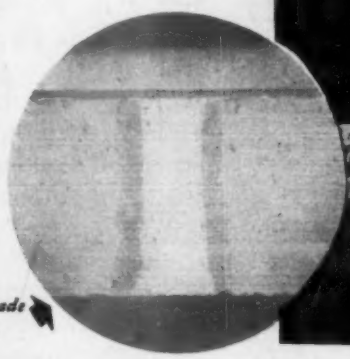
FHP *SPEEDS*
BALDWIN LOCOMOTIVE PRODUCTION



Using the correct M & T electrode . . . plus a wealth of welding "know-how" is the combination that consistently produces high speed, high quality fabrications at low cost in the Eddystone plant of the Baldwin Locomotive Works.

An excellent example is their production line manufacture of water-space frames . . . or mud rings as they are more frequently termed. These frames, used in locomotive boiler assemblies range from 4′ x 5′ up to 10′ x 22′ in size and are made from bars 4″ to 8″ in width and 3″ to 5″ in thickness. All welding is done in straight-sided gaps with 5/16″ Murex Type FHP electrodes at approximately 600 amperes . . . an overloading of current which few electrodes will withstand. Results however, are extremely high speed operation with no sacrifice whatever in welding quality . . . a neat trick but daily routine at Baldwin where welding ingenuity and M & T electrodes combine to provide welding speed, quality and economy.

Want literature covering the entire M & T line? Write today.



Cross section of straight gap weld made with FHP in Locomotive mud ring.

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MUREX WELDING ELECTRODES
M&T ELECTRODES and GAS RODS
M&T WELDING ACCESSORIES

Courtesy U. S. Steel Corporation

WORLD'S LARGEST integrated steel mill as seen from the air—the Gary Works of Carnegie-Illinois Steel Corp.

Keeping the Mills Rolling

An important phase of welding maintenance in a steel mill is concerned with breakdowns that don't happen

BY FRANK J. GAYDOS

General Foreman, Weld Shop, Gary Works, Carnegie-Illinois Steel Corp.

We have all heard praises of welding in mass production, but behind the brilliant ball carrier is a group of sturdy linemen without whom production touchdowns could not have been made. This unsung group in the background includes the maintenance weldors.

These helmeted and goggled workers seldom have the up-to-date equipment and relatively pleasant working conditions enjoyed by the production workers. They work in snow and ice, fumes, grease, water, steam and heat, welding and cutting in all positions on materials as they come, clean, dirty or rusty. One job is seldom the same as the next, and the maintenance weldor must know all phases of welding.

Keeping 'Em Rolling

Operating units had to run and produce during the war. Old equipment had to remain in service and had to produce even more than had formerly been deemed possible. We can all take pride in the fact that the steel industry broke record after record with equipment that was supposed to have been worn out. The men on the production lines, however, will testify to the effort, initiative and resourcefulness of the maintenance crews. Many times a welding rod in the hands of a maintenance weldor plugged the "hole in the dike" and made it possible for a mill to keep going until new parts could be secured or a major repair job accomplished. The war slogan "Keep 'em rolling" was literally true in our case.

The true worth of a man as a weldor craftsman is well demonstrated in his ability to perform the work involved in the maintenance of a steel plant. Processes range from coke and gas manufacture, the generation of utilities, blast furnace and open hearth operations, to and through primary and finish rolling. By the nature of their operations,

1—WOBBLERS serve to transmit power to a roll from the coupling boxes. One of these 36-in. rolls had been hard-faced (right); the worn one not

2—CYLINDRICAL PARTS may be built up uniformly on a lathe with an automatic welding head. Note various diameters of journal

Some rolls can be built up by automatic hard-facing

steel plants are not embodied in a few multistoried buildings but are stretched out in single-story structures over considerable areas. Field equipment must necessarily be mobile.

At Gary, day-to-day maintenance and field erection assignments are planned the day before. Each department, such as structural, electrical, machine and pipefitting, sends a list of jobs and locations to the welding department. The same practice is followed by the operating units who need welding service for the millwright crews. The field foreman lines up the personnel and makes up a list of machine moves which must be made during the midnight shift. A truck service is maintained by the welding department for transporting men to the more distant locations for emergency repairs and for delivery of oxygen or acetylene tanks, welding rods or other equipment as required or as job needs develop.

"Doodlebug" Welders

Occasionally a breakdown occurs, and a distraught operator calls frantically for help. It may happen that the field foreman has all available manpower and equipment out on scheduled jobs. He, therefore, finds himself with an intriguing problem of moving men and equipment around like checkers. These are the times when versatility, portability of equipment and ability to improvise are important.

We have found that our so-called "doodlebugs" are the kings in this checker play. These units are shop mules with 300-amp welding generators driven from a power take-off and equipped with oxygen and acetylene cylinder carriers, cable reels and containers for electrodes and supplies. The units are of sufficiently narrow wheelbase to maneuver in cramped places.

Such gasoline-driven units are more expensive to operate than standard welding equipment because of the cost of tires, motor and drive repairs, gasoline, oil, anti-freeze and other items, but the extra cost is absorbed in savings made in the time involved in getting to the scene of action and in the ability to get a mill back in operation sooner. It is not economical to operate gasoline-driven equipment where welding operations are prolonged, where high amperages are necessary or where electric current is available. In those cases, the doodlebug will start a job while a conventional electric motor-generator machine is being trucked to the site and connected to a power line. The heavier machine then takes over, and the doodlebug is moved to another assignment.

The electrodes used for emergency repair work are principally the AWS E-6012 type for low heat input and the E-6010 rod to provide more fluid metal for getting through rust and on pipe work. Since their advent, the new hydrogen-free electrodes are employed for questionable conditions and for use on higher carbon steels and castings.

Optimum welding conditions are seldom encountered. Because of the heat conditions and the cooling and lubrication requirements of the operating units, work places are not as neat as a pin but are likely to be rather messy. Maintenance weldors are compelled to develop their judgement by working on grease-covered and rusty pipes and equipment. The necessity for working on steels varying in composition from 0.08 to 0.80% carbon requires a detailed knowledge of electrode and rod types, welding techniques and procedures.

Preventive Maintenance

The ultimate goal of maintenance welding is not merely to get the mills fixed, which may be taken for granted, but rather to prolong the life of mill elements, to eliminate breakdowns as far as possible, to avoid mill delays, expensive repairs and replacements, and, in general, to strive for still further progress in the field of preventive maintenance.

Preventive maintenance is a goal which requires the co-operation of all the service departments and the operating units. It starts on the drafting board and is followed through by attention to detail and

3—SHAPE-CUTTING is also used in maintenance. This multiple-torch machine turns out thousands of such parts as entry and delivery guides

usage in the various shops. Careful follow-up by the mill operators is essential to check results. This type of maintenance also demands study and the fortitude required to experiment without giving up when the going gets tough.

If medical and biological research can increase the life tenure of man (who represents the most complex and delicate piece of machinery on earth), surely good maintenance research can increase the life of mill machinery. This constant job of conquering wear and tear is at once our most intriguing problem and our biggest headache.

When ingots weighing tens of tons are rolled or forged, huge machinery is required. The pressures are intense, and wear, shock and impact are all abnormal. Steel mills are not designed to operate as smoothly as a fluid-drive car but to withstand impacts amounting to millions of pounds. Instead of fitting in terms of thousandths of an inch, many mill elements are assembled on the basis of what an idealist would term a "sloppy fit." This can be accounted for because of the magnitude of the units themselves and the necessity of being able to make changes and repairs quickly and easily. There are attendant disadvantages: the so-called "sloppy fit" is largely responsible for severe impact and abrasive action in connection with spindles, coupling boxes, pinions, rolls and other heavy mill parts.

Hard-faced Wobblers

Fig. 1 illustrates what happens on the wobblers of a 36-in. slab mill roll. The two rolls went into service at the same time, but one had hard-faced surfaces while the other (left) was "as cast." Hundreds of welding hours were spent in building up wobblers like these, and this tedious welding job had to be done four or five times during the life of a roll. It is easy to say that hard-facing was the obvious solution, yet how many times do such obvious solutions escape our attention when we are busy with the routine duties or hesitate to try a new idea?

In practice, the obvious solution proved to be far from obvious, for the build-ups had a tendency to pull away from the 0.35-0.40% steel used in the wobblers. After considerable study, we discovered that the trouble lay in the base metal itself. The parts being built up had been under continual impact, and the metal was in a state of fatigue. The condition was finally overcome by scarfing off the battered metal and building up on good solid base metal. Generally, about ¾-in. of metal had to be removed before the minute stress cracks were eliminated and a solid base exposed. We then built up with a 0.25% carbon E-6012 electrode and finished with a pass from a molybdenum or nickel-manganese steel electrode.

In work of this character, weldors must adhere strictly to template size (after properly centering the workpiece) and then grind the roll to size. This care in rebuilding will eliminate the necessity of machine work. One reconditioning now lasts the life of the roll. Much of the wear and tear is avoided, and torsion of the operating parts is lessened. Hence the mill operates more smoothly, and this, in turn, plays its part in increasing mill performance and quality and certainly in reducing repairs and breakdown losses in operation.

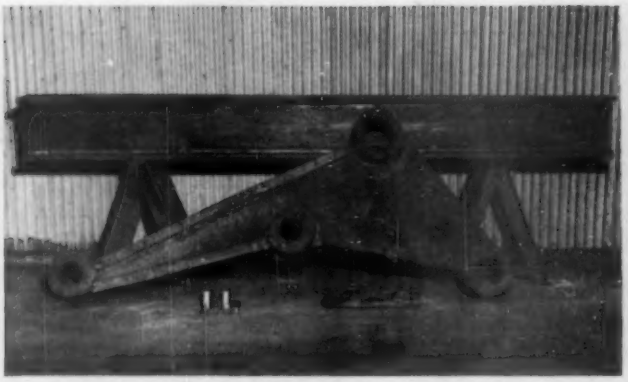
This job offers a good example of preventive maintenance, for it is not necessary to wait until the wobblers have been worn to knife edges. Hard-facing can be readily applied to a new wobbler before it goes into service by merely scarfing off the foundry mold crust and applying one, or at most two, passes of hard-facing material.

Knives that Cut Steel

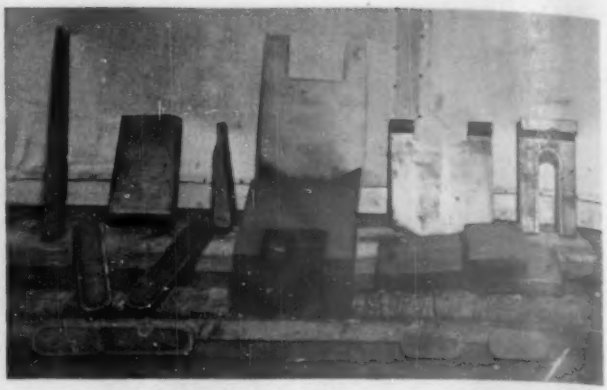
Another hard-facing application combats combined pressure and hot abrasion in connection with slabbing and blooming mill hydraulic shear knives. These giant knives are 6 in. thick, 65 in. long and 12 in. wide. They were formerly made of various alloy steels and had a life of approximately 10,000 tons of sheared product. Prewar shearing operations were mostly on ordinary carbon steels. Wartime alloy steels and armorplate played havoc with the knives. The problem was finally solved by replacing the alloy knives with 0.45% carbon plate, undercut ⅛ by 1 in. on the side and bottom faces. The undercut edge was then overlaid with a single pass of hard-facing material. Knives fabricated in this manner sheared 60,000 tons of difficult-to-shear products.

Tong bits, used in stripping ingots from molds, formerly lasted only eight hours and sometimes less. These bits were re-designed at points of highest stress, and the contact edge was hard-faced. This treatment increased the life of the bits to approximately 320 hours. With the additional life, high tong pressures were achieved, which greatly decreased the percentage of "stickers." This, in turn, cut stripper operation time, allowing the ingots to get to the soaking pits at higher temperatures.

The foregoing constitute merely a few examples of preventive maintenance work involving the use of hard-facing applications. Those mentioned were big jobs, but one should not forget the small parts, guides, dies, pusher rods and similar pieces where the application of a little



4—ORE UNLOADER bucket arm and car side frames are typical of many parts now being fabricated by welding



5—WEDGES, links, journal-box covers, charging peel heads are produced in thousands by flame-cutting

"blob" of hard-facing will save time and assure smoother operation by increasing the life of a piece. Chances for improvement will be found everywhere.

Hard-facing problems are not too easily solved, nor is any one rod the panacea and cure-all for wear problems. Each application needs study and experiment to develop proper base materials and the correct electrode or rod, preheat, postheat and welding procedure. Sometimes a low-priced rod will do the job, while at other times rods costing several dollars a pound are necessary. Proper usage and application, however, often make the higher priced rods the least expensive.

Repair of wear on bodies and journals of table and guide rolls needs consideration of such things as marking of the product, necessary coefficient of friction for transport, heat of the product, and the reaction of bearings. For these reasons build-ups generally should not exceed 250 Brinell hardness; 200 is better.

Building up on a Lathe

In most instances the elements being built up are round. Manual build-up commonly results in uneven contour, creation of high and low spots and a tendency to overweld. This condition is detrimental to machine tools and consumes too much machine time in finishing the work.

A lathe of sufficient swing and length to take a large part of the work encountered is ideal for handling these circular jobs. Such a unit equipped with an automatic welding head is shown in Fig. 2. Its use will produce savings of up to 60% of the labor costs in weld-metal deposit alone, although the wire cost is slightly higher. Most of the build-ups at Gary are made by wire depositing a 0.25% carbon overlay, although there are some applications of harder metal. This type of build-up is sufficiently hard to take care of normal requirements of wear, friction and machinability. The deposit is uniform and concentric, and bead layers overlap nicely to produce a surface that may be easily machined.

The steel mill maintenance department will, of necessity, perform welded fabrication work. A 20-ton ore unloader bucket arm and car side frames are the examples shown in Fig. 4. Many patterns are scrapped after years of disuse, but replacements can be readily fabricated of steel plate.

Engineering progress has developed the use of more and more fabrications by welding. When drawings originally made for castings are used, the layout and assembly men must be sufficiently trained to convert them intelligently into plate fabrication. In this conversion work, one has to have an original mind and be willing to throw the time-honored quirks, customs and foundry practices out of the window. Welded fabrication resolves itself into simple elements, but if changes are made, the field condition must be checked if satisfaction is to be assured. Most welding jobs are tailor-made. When quantity or repetitive items are ordered, use of jigs and automatic welding equipment will increase production and hold cost to a minimum.

Portable and pantograph-type shape-cutting machines (Fig. 3) are important tools around a shop. Rolled plate of various compositions is used to produce shapes and blanks for finish machining and final heat treating. Gear, sheave and pulley blanks, pipe flanges, liners, wearing plates, pug mill blades and similar items may be readily flame-cut.

Contributions of Flame-Cutting

A substantial saving was made in our shop by shape-cutting entry and delivery guides. These are used by the thousands in rail and merchant bar mills to guide the product being rolled through the various mill passes, each rolled section and pass having a guide for its peculiar shape. Formerly these guides were forged at a substantial cost per piece; now they are flame-cut from 0.45% carbon plate. Shape cutting results in low unit cost per guide, especially if a multiple-torch machine is used. Likewise, the operators are able to obtain guides on short notice, which affords them greater flexibility in rolling schedules.

Another example of the application of multiple-torch cutting is in the production of steel wedges 1½ by 1½ by 6 in.; such wedges are used by the thousands in connection with the stripping of ingots. Fig. 5 shows some of them and also links, journal-box covers and charging peel heads produced by flame-cutting.

The foregoing examples will serve to indicate how the maintenance welding department has become a vital cog in smooth plant operations. Sometimes the result is seen directly; at other times the result is indirect. Modern equipment, late electrode developments and all welding processes must be watched closely.

FLAME-CUTTING water tank into three sections. Cutting was done from a scaffolding inside the tank

TWO 16-TON truck cranes pick up the 5½-ton top section and lower it to the ground—a ticklish job

Cut Down for Moving

Water tanks 21 ft in diameter and 40 ft high were torch cut into three sections to be transported to new site several miles away

BY MARGARET RALSTON

DISMANTLING and moving of an all-steel, 16,000-gal water tower by carving it into sections with oxy-acetylene torches was recently undertaken successfully at Vancouver, B. C., after the job had been termed "practically an impossibility" by a number of construction companies.

TANKS ON TOWERS

The tower—one of three such idle water towers to be moved—was originally located in the municipality of Burnaby, a suburb on the southeast edge of Vancouver. The three towers were built about 36 years ago as expansion tanks for Burnaby's water system, but were abandoned about 12 years ago when the municipality was hooked up to the Greater Vancouver water system.

The abandoned tanks could be used for oil storage at the Imperial Canneries of B. C. Backers, Ltd., located at Steveston several miles away. The problem was to get them there.

Last spring the B. & A. Power Construction Co. accepted the contract for dismantling and moving of the towers at an estimated cost of $16,000. Each tower stood 90 ft high, and the water tank itself—the part to be moved—measured 40 ft high by 21 ft in diameter. In order to reach the tanks, it was first decided to build outside scaffolding, but this could not be done because of a shortage of suitable lumber. Hence the more difficult task was undertaken of erecting short scaffolding inside each tank.

Each of the tanks was cut from the inside out into three sections, four small areas being left on each cut to keep the tank in place until time for dismantling. When cutting had been completed, the hazardous task of removing the 5½-ton top section began. The big steel chunk was fastened to the hook blocks of two 16-ton truck cranes. The cranes were mounted on trucks of Terminal Cartage, Ltd., which was given the sub-contract for crane work and hauling by Merchant's Cartage Co., Ltd.

With the top section safely on the ground, the second section, ending 2 ft above the outside catwalk, was lowered. The third section, similarly handled, included about 10 ft of the tower's legs. Rest of the supporting structure was razed.

CUT UP AGAIN

The sections were still too large to be carried through the city streets either lengthwise or sidewise. Each of them was accordingly cut in two. Carted piecemeal to the new location, the tanks were reassembled by welding them together, a month-long job. Today you would never know but what they had been built on the spot.

2—WATERGLASS painted on surfaces of cutter teeth glues granular tungsten carbide in place for sweating

3—SWEATING ON the tungsten carbide coating is done by the oxyacetylene flame at 34 hooded stations

Bits for New Oil Wells

As oil goes deeper, so must the oil man's drill. Without welding, it wouldn't be possible to produce a properly functioning rock bit

BY GERALD ELDRIDGE STEDMAN

DOWN, *down,* DOWN! Some oil wells today probe into Mother Earth's tough hide as far as 17,000 ft to bring up the lifeblood of our civilization. The tool most responsible for reaching these tremendous depths is the rock bit.

Teeth that can chew away up to three miles of rock are something to write about. How they are made and hardened will shortly be revealed. Suffice it to say now that the tremendous present activity in drilling new oil wells all over the world to depths hitherto unknown has been made possible only because of welding and its advanced techniques.

1—CROSS ROLLER production line is serviced by roller conveyors. All of the machinery is arranged for a progressive sequence of operations

From the Heart of Texas

Houston, heart of the Texas oil industry, is also the natural center of manufacture for oil-field equipment. Prominent among such producers is the Reed Roller Bit Co., maker of rock bits and other drilling tools. I had the privilege of touring this plant in company with W. B. Noble, vice-president and chief engineer; H. C. Tooley, vice-president in charge of manufacturing; O. O. Selke, plant superintendent; Jack A. Grundy, production manager, and C. H. Elliott, assistant to the president.

Integrated teamwork under the principle "the group is the expert" has produced astonishing records for Reed. Plant production efficiency under its incentive system is 112%; turnover but 3% and absenteeism 2.8% per average month. Overall supervisional ratio is one to 18; lost-time accident severity 1.7; frequency 12.96. Scrap loss runs less than 1% in most departments.

The variety of formations en-

4—FOUR QUADRANTS of rock bits are tack welded. Overhead crane carries assemblies to welding booths

5—PREHEATER RINGS fitting over the bits heat them as they wait outside doors of 21 welding booths

countered in oil-well drilling is amazing to the uninitiated. Sticky formations and shale, salt, unconsolidated sands, soft limestone, gypsum, anhydrate, lime rock, abrasive limestone in all degrees of hardness, corrosive hot mud and slush . . . these must all be considered in the selection of the proper rock bit. Bits vary in the number, size and spacing of the teeth, and each pattern is selected to accomplish a fast and straight full-gauge hole at sensible rotary speeds.

The Reed rock bit is composed of four quadrants, two carrying side cutters and the others carrying cross rollers. The components of a rock bit are short cross roller, long cross roller, right and left side cutter, two side cutter bushings, bridge, two side cutter lugs, short and long cross roller lugs, required number of roller and ball bearings. Diameters of the bits vary from 3¾ to 26 in. The larger diameters start the drilling cut, and the bore is progressively decreased in size as drilling deepens.

"No nuts or bolts are used in the assembly of a rock bit," Mr. Elliott pointed out to me, "The assembly is held together entirely by welds. No other method of assembly has yet been found which will successfully withstand the terrific strains, stresses and vibrations to which a rock bit is subjected."

The Reed plant evidences many innovations in shop practice and layout. Flow is arranged so that inspectors are almost automatically in control of materials handling. Distinct economies result, both in the signal of bottlenecks and in conservation of movement. Much Reed production is palletized in trays and work either gets into or out of tray only through inspection. Nice system.

Reed's practices in disposal of scrap shavings, overall plant control which shows up personal production efficiencies, special machinery and selective carburizing are further evidence of the advanced methods in its shop practice.

There are eight flow lines in the Reed plant. Fig. 1 shows the cross roller production line serviced by roller conveyors. Machinery is arranged for a progressive sequence of operations.

Certain of the lines have some unusually advanced machining. The six-spindle thread mill that mills a double conical thread in preparation of the long cross cutter, the ten-spindle milling machine that mills teeth by duplication on ten spindles of the follower's pattern using a sample production piece, are illustrative of this advanced machining.

Hardening Cutting Teeth

On the long cross cutter line, a section is devoted to sweating on granular tungsten carbide on the rock bit teeth to give them an extremely hard wear-resistant case. This bears resemblance to a welding process. In preparation for the sweat-on operation, teeth are painted with waterglass (Fig. 2), which serves as the binder to retain the coating of granular tungsten carbide. The bits are inspected to assure proper amount of coating and adherence of the tungsten carbide. After inspection, the bits pass on to 34 welding stations (Fig. 3), each excellently hooded and ventilated with 750 cfm of air.

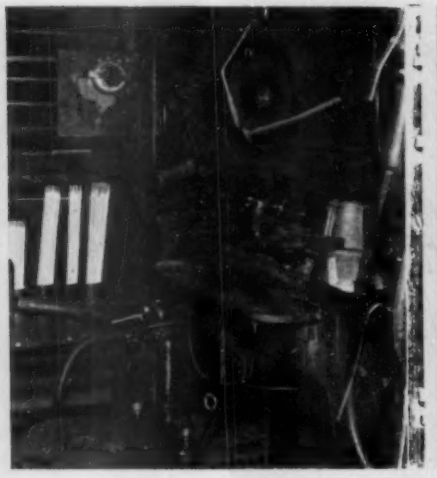
Oxyacetylene torches are used in this sweat-on welding operation. Reed produces its own acetylene, and the tungsten carbide coating is fused on in two applications of the torch. The technique is really a flame bath without a filler rod. In certain designs and for particular teeth, the need for precise attention makes something of an art of the sweat-on process.

Converging Subassemblies

The cutters move on to heat treatment. All component lines converge at a 5-ft rotary subassembly table, over which trays of bearings are centered. Here, the components of each quadrant are assembled. The table is designed to produce maximum economy in operating movement. It rotates on a stem-and-ball turn, is flooded by fluorescent light. Near the subassembly table, I noticed unique apparatus to install ball bearings in their lubricated races by pneumatic action and measured count through a hole. There are five such machines in operation.

"These quadrant subassemblies are brought together progressively on rotary assembly tables," Elliott ex-

6—OPENING DOOR causes preheated bit to swing inside the booth underneath a small air hoist



7—WATER-COOLED copper guides control bead. Welder, above booth, is operated by remote control

8—EJECTION after welding. The platform holding bit swings out of booth when the exit door is closed

plained as we watched the operations. "Following the final assembly of the four quadrants to produce the rock bit, this assembly is tack welded and the assembly fixtures are removed.

"The tack-welding stations (Fig. 4) are located at the end of the final assembly bench so that the progression of the work is continuous. When the rock bits are delivered at the opposite end of the tack-welding booth, they will lie underneath an overhead crane, which is used to deliver them to the welding booths where final welding of the four quadrants is performed.

Preheating While You Wait

"The tack-welded bits are placed on a platform attached to a hinged door of each welding booth (Fig 5). A circular heating ring is counterweighted above this platform to preheat the rock bit prior to welding. When the operator inside the booth is ready for the rock bit, he merely opens the door. This action automatically swings the preheated bit into the booth (Fig. 6), underneath the small air hoist used to position the bit on the welding fixture.

"Arc welders are of 300-amp capacity," Elliott continued, "and 3/16-in. and 1/4-in. electrodes are used. The welding of the four quadrants is performed with the bit in a vertical position. The operator uses as much current as his individual skill will permit him to handle. Single-pass welds are made. Water-cooled guides of copper (Fig. 7) control the bead and assist in chilling it to speed up the welding operation. The cutters and bearing journals of the bit are submerged in water during welding to prevent too much heat from flowing into the bearings.

"After the operator has completed the welds, he again uses the air hoist to place the rock bit upon a platform attached to the door on the opposite side of his booth (Fig. 8). This platform swings out of the booth when the door is closed. The rock bit emerges underneath another bridge crane, which transports it on through annealing (performed by induction heating) and ultimately delivers it to the final machining operations. Prior to the removal of the bit from the platform in the welding booth door, however, the weld must be inspected and stamped by an inspector; this gives the rock bit the green light to go ahead into the final operation of machining."

Welders Stay Outside

The weldor's comfort has not been forgotten in this set-up. A slot directly in front of the welding station connects to an overhead exhaust system which draws 2,000 cfm of air out of each booth. Furthermore, each operator is provided with a 16-in. fan to use as he chooses. The heat from the welding machine is no problem because the welders aren't in the booths but repose on a platform above them. Only the control panel is inside the booth. Within the welding booth, all of the weldor's controls, materials and tools are located within his easy reach according to approved motion-economy principles.

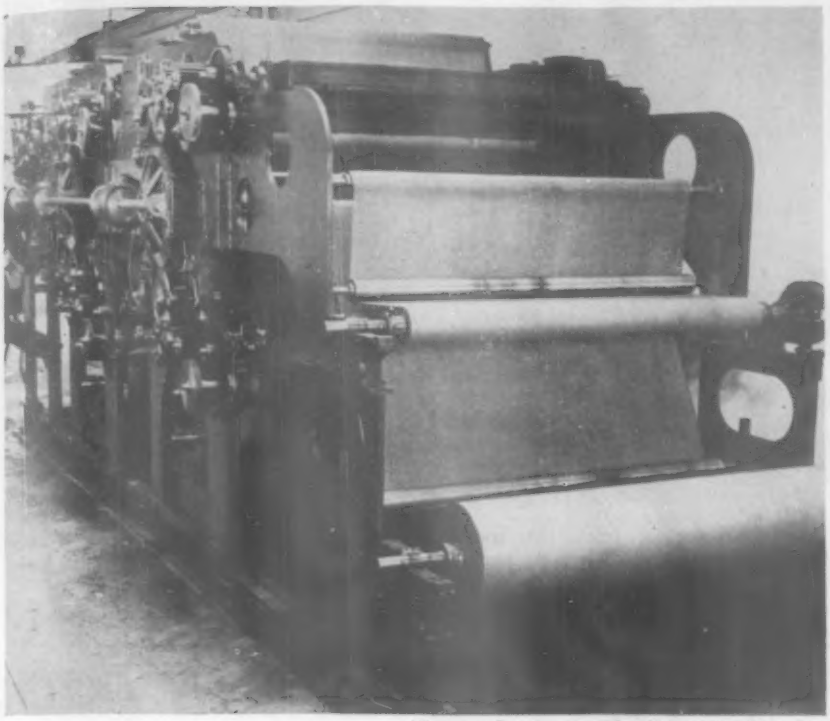
This final welding assembly involves 21 booths or stations. The rock bits stand in water throughout the welding procedure, which dissipates welding heat and provides complete protection of the bearings. The gas-fired preheating rings are counterweighted for easy lift. The booths are so designed that there is no unpleasant arc flash.

One of the unusual factors is the swing platform that brings work into the booth and out of it. Hoist arrangement is particularly efficient, both in and out of the booth. Time-motion studies have been made to effect greatest ease and minimum movement in operations. The welding procedure is, in itself, an example of the high efficiency evolved by Reed in materials handling.

Five tubs, served by overhead monorail, take care of annealing the bits by induction heating after welding and prior to final machining. Temperatures involved are 1,700-1,300 F and must be controlled carefully as too high temperatures will harden rather than anneal. The induction heater is a 50-kva model, and the annealing time is between 5 and 6 minutes.

In the final machining, the heads are turned, threaded, faced. Finally they move to a conveyorized painting line and then to shipment.

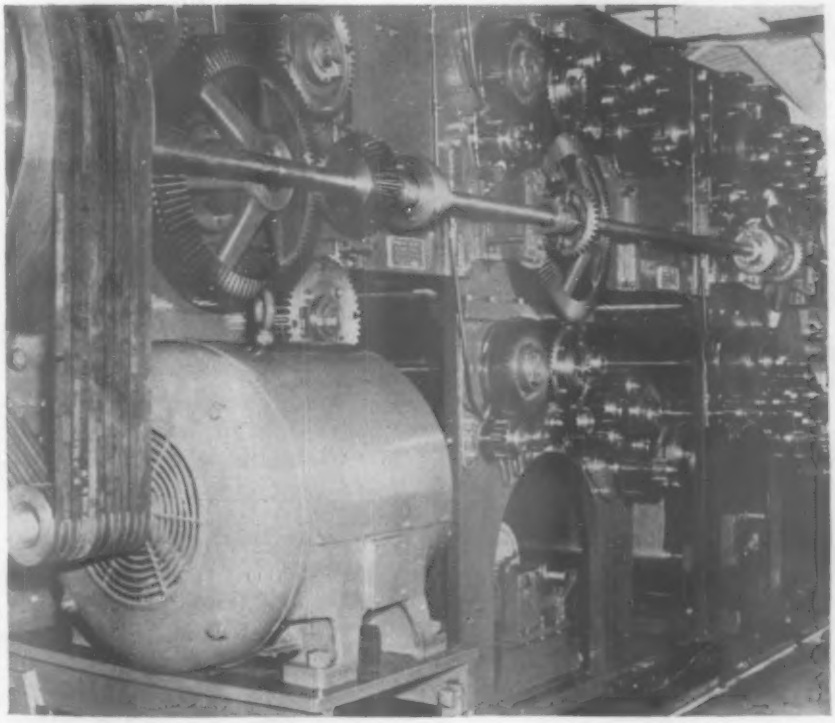
About 34% of Reed production is exported, and Reed roller bits go to every oil-bearing country of the world.



Photographs courtesy The Hobart Brothers Co.

16,000 ORANGE WRAPPERS a minute can be printed on this rotary press

WELDED Printing Press



DRIVE SHAFT and gear mechanism. An automatic oil lubricating system sends oil to every moving part every four minutes. The press has 52 rolls

Rotary printing press built for a California paper mill has over 400 welded parts, including 40 of its 52 rolls

BY R. G. SWISHER

JOHNSON AND THOMAS Machine Works, Inc., a California fabricator, recently completed a huge rotary printing press of welded design for the Fernstrom Paper Mills, Pomona. Calif. This press is 30 ft long, 15 ft high and weighs 35 tons. Eight months of engineering and over 75 full-size blueprints were required to produce it.

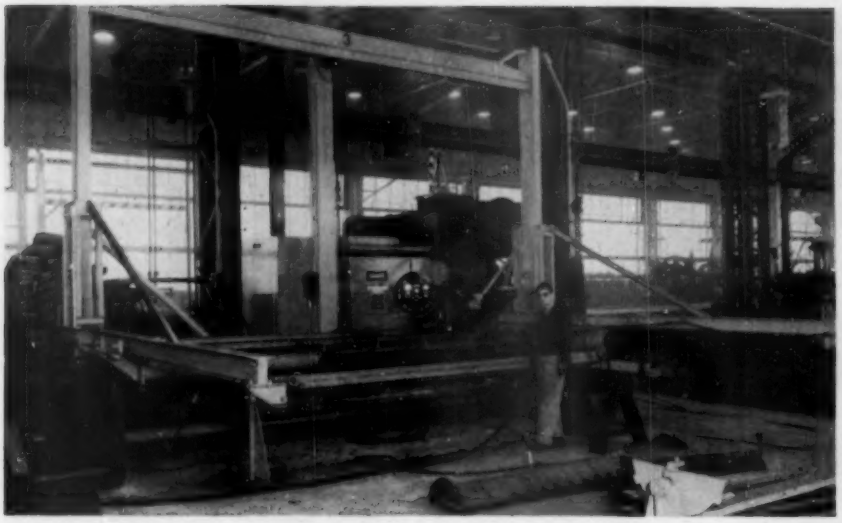
John Boaz of the machine works designed the press for the special purpose of printing orange, lemon, grapefruit and tomato wrappers. It will print as many as 16,000 wrappers a minute from four rolls of lightweight paper 7 feet wide. An idea of the complexity of the structure may be gained from the fact that there are over 400 welded parts, including 40 of the 52 rolls.

The rolls in the press range in diameter from 8 to 30 in. The largest is the 30-in. transfer roll, which was fabricated from 1-in. steel plate rolled to its diameter and arc welded. This one roll weighs approximately 2 tons and was balanced to within six ounces.

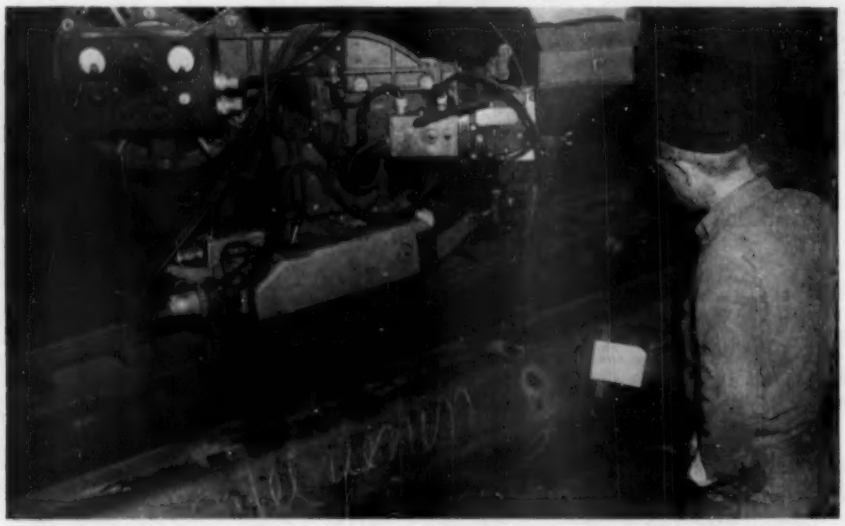
The press was constructed in four sections that are bolted together to form the assembly. The main frames were flame-cut to shape from 2½-in. steel plate. Pads of 1-in. steel plate were welded to the shapes and machined to within 0.001 in. to assure good alignment.

This press is believed to be the first of its kind ever constructed of steel plate by welding. Prototypes were made of cast material with side frames as much as 6 in. thick. Pattern savings effected by the welded job alone amounted to over $1000. Contract called for delivery within one year, but the press was installed 10½ months after the order had entered the engineering department. This is just 13 months less than the time required to build previous cast models.

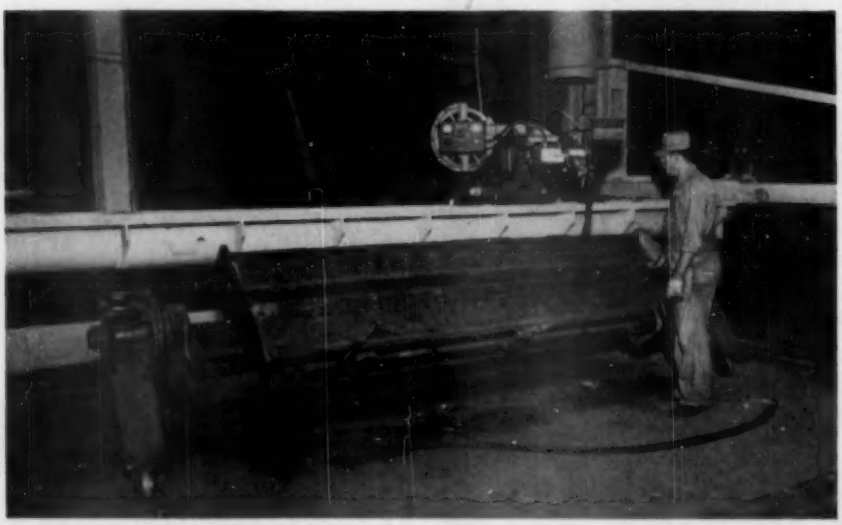
Besides its all-welded construction, the press features an automatic oil lubricating system which sends oil to every moving part every four minutes.



1—MACHINE NO. 1. Of Gar Wood design and construction, this special fixture permits the submerged-melt head to be moved in three dimensions



2—MACHINE NO. 2. Yoke spreader for four-wheel scraper. The second automatic welding station is also used to make drawbar boxes and wheels



3—MACHINE NO. 3 is finishing a bulldozer moldboard. This part is about 9 ft long and requires seven seams to be welded at different speeds

4—SCRAPER-WHEEL rim of ½-in. galvanized steel is welded to hub

Gar Wood A

Multiple-duty fabrication in three submerged-melt welding fixtures speeds production of the components for 13 models of road-building equipment

BY CLYDE B. CLASON

In operation for two years now, the big new Gar Wood plant at Mattoon, Ill., is hitting its stride. This plant was built especially for road-building machinery and is one of three plants comprising the Findlay Division of Gar Wood Industries, Inc. Executive offices of the division are located at Findlay, O.

The Mattoon plant manufactures bulldozers, dozecasters, rippers and scrapers, each in several different types or sizes. Bulldozers are offered in two models, dozecasters in two models, rippers in two models, four-wheel scrapers in five models and two-wheel scrapers in two models.

The fact that there are so many different models to be made has complicated the company's production problem. Assembly-line production methods are gradually changing the plant in appearance, and its former

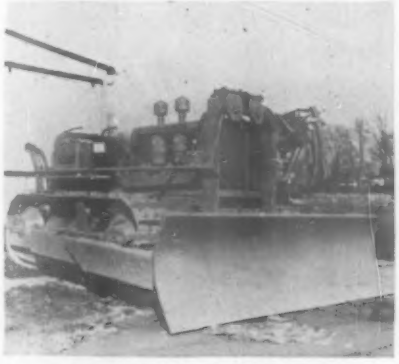
Photos courtesy The Linde Air Products Co.

5—FRONT FRAME for dozecaster calls for ten welds. This boxlike section is 7 in. square and has two bends

6—CORNERS of channel for front dozecaster frame are hand trimmed. Operator makes five cuts per piece

Adapts Automatic Welding

To Bulldozers, Dozecasters, Road Scrapers and Rippers



DOZECASTER ready to go to work

FOUR-WHEEL SCRAPER being used in construction of Baltimore airport

resemblance to a shipyard is disappearing. Like a shipyard, however, it still specializes in the production of prefabricated components, welds these into key subassemblies and joins the various subassemblies into complete units.

Flat steel plate varying in thickness from 3/16 to 2 1/2 in. and structural steel channels are the basic materials. These are shaped by shearing, flame-cutting and bending and then welded into the required components. Both automatic and manual arc welding are used extensively; in general, automatic welding for the fabrication of structural members and manual arc welding for tacking, joining members into subassemblies and welding subassemblies into final assemblies.

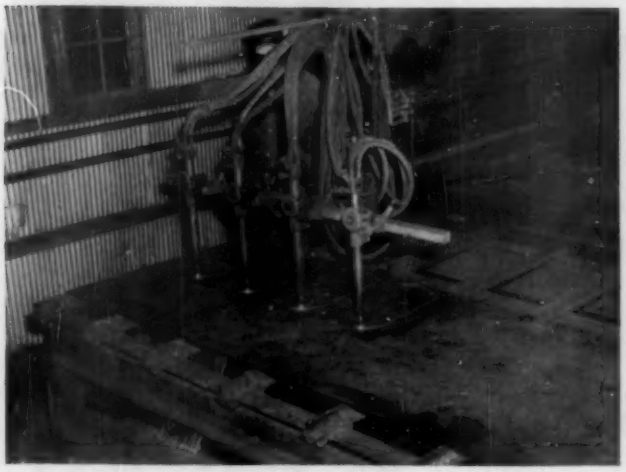
Plant and Equipment

For the statistically minded, the Mattoon plant measures 500 ft long and is divided longitudinally into north and south bays, each 57½ ft wide. Separate buildings are provided for painting and mechanized flame-cutting. Hand flame-cutting, however, is done throughout the entire plant; there are 150 oxyacetylene station outlets scattered every 20 ft or so down the outside walls of both bays. Both oxygen and acetylene are supplied from central manifolds located outdoors.

Cutting equipment includes two shape-cutting machines, a portable machine for straight-line cutting (used mostly for ripping) and 50 hand torches. There are also five 250-cu-ft oxyacetylene heating heads used for forming and bending and two 6-in. wide flame-priming heads.

Hot forming is done on hydraulically operated blacksmith presses, and cold forming is done on an enormous 300-ton press brake that is capable of bending plate up to ¾ in. thick and 16 ft wide.

Manual arc-welding equipment totals 105 a-c arc welders, mostly of



7—FLAME-CUTTING by four torches simultaneously produces side plates for a four-wheel scraper sheave

8—FLAME-BENDING a dozecaster side frame. Multiple-flame head heats piece prior to press bending

500-amp capacity. Included, however, are some twenty 300-amp models, several of which are hooked up in parallel to make 600 amperes available.

Fixtures for Submerged-Melt

Automatic equipment consists of four standard-model submerged-melt heads, each operated from a 1,000-amp transformer. Three of these heads have been fitted into special fixtures, designed and built at the plant which permit movement in three dimensions. These welder-fixture combinations are spoken of as Machine 1, Machine 2 and Machine 3, and it is their astounding versatility that renders possible the plant's present production methods.

Machine 1 is used to make upper structure braces for scrapers, bulldozer and dozecaster side frames, cutting-edge bases for four-wheel scrapers.

Machine 2 welds wheels for two-wheel and four-wheel scrapers, ripper wheels, yoke spreaders for four-wheel scrapers and drawbar boxes for scrapers.

Machine 3 has been assigned to such varied tasks as the fabrication of moldboards for bulldozers and dozecasters, front frames for dozecasters, lift arms for bulldozers and dozecasters, ripper tongues and ripper boxes.

All other members than these are still fabricated by manual welding. The company is planning, however, to use a fourth automatic head for the welding of aprons, gates, bowls and side frames for scrapers. This head will be underslung so as to eliminate jig turning and catch all welds with one position of jig base. Eventually all other heads will be changed in like manner. Recently, the third and proposed fourth fixtures were widened to accommodate two of the longest jigs. Production is thus speeded up by alternating jigs back and forth; *i.e.*, one jig is loaded while the work in the other is being welded.

Walking down the north bay from the office, we pause at the first automatic welding unit, which is being used to weld cutting-edge bases on four-wheel scrapers (Fig. 1). The welding-head carriage travels on a track, which may be raised or lowered to any height or moved in a horizontal plane at right angles to its normal longitudinal travel.

Bulldozer Side Frames

Later in the day, the writer discovered the same welding head engaged in the production of bulldozer side frames. Each frame consists of channels pressed from ½-in. plate and joined to flat plate by continuous fillet welds. After plates have been assembled by arc tacking, the two 12-ft-long seams are welded automatically at a speed of 15 inches per minute. No joint preparation is necessary. Machine is set at 800 amp, 30 volts, for ¼-in. mild-steel welding wire. Two of these frames, one for each side, must be made.

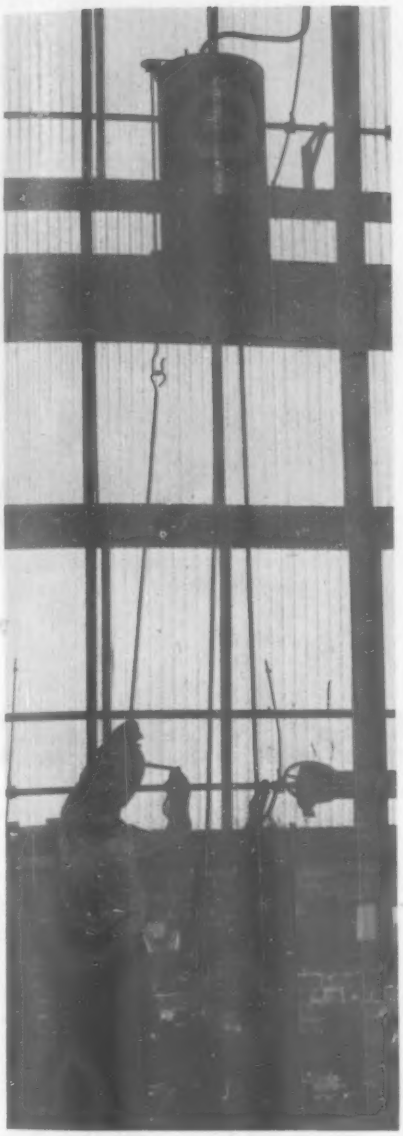
Dozecaster side frames are also made at this station. A dozecaster, it should be explained, is the same as a bulldozer except that its blade may be adjusted to different angles.

Passing now to the second machine (Fig. 2), we see the fabrication of a yoke spreader for a four-wheel scraper of 11-cu-yd capacity. This hexagonal-shaped box is 11 ft 4 in. long, 12 in. wide and is made of ⅜-in. plate. Two full-length seams are made at a speed of 9 inches per minute, using 3/16-in. wire and a setting of 500 amp, 30 volts. A special back-up bar enables welds of 100% penetration to be secured.

Drawbar boxes for scrapers are also welded on Machine 2; these are square tubes about 4 ft long by 8 in. in cross-section. Four full-length seams are made to join the ½-in. and 3/8-in. plates into the required boxes. Production of these members is about three times what it was with manual welding methods.

On Machine 3, we find that a rather complex part is being fabricated: the moldboard for a bulldozer (Fig. 3). This particular model consists of a section 8 ft 7½ in. long by 32 in high. The moldboard is fabricated of 3/8-in. and 1/2-in. plates, and seven seams are needed to complete it. These seams are made at different speeds; three at 20 ipm, one at 10 ipm, one at 14 ipm and two at 16 ipm. Current setting is 600 amp, 30 volts, and ¼-in. wire is used.

Fig. 3 also gives a very good view of the manner in which the track of



9—ELEVATED POSITION of welding transformer is no bar to current adjustment from the ground

10—PRESS BRAKE was repaired in two days. Base plates 2½ in. thick had cracked, one on a side

the welding carriage is supported. The pipe to which the track is bolted is 10 in. in diameter and about 30 ft long; it may be moved either vertically or horizontally in a direction perpendicular to its axis.

Steel Wheels for Scrapers

Walking back to Machine 2, we find that the scenery has been changed; the machine is now busily engaged in the welding of rims to hubs (Fig. 4) to make big steel wheels for two-wheel and four-wheel scrapers. This is a difficult welding operation as the rim is formed of ½-in. galvanized steel. The rim OD is 22 in.; the hub OD 19½ in. Simple arithmetic shows that there will be a circular seam of approximately 60 in. to be welded.

The welding head is held stationary, while the wheel is rotated on a revolving table. Mild-steel welding wire of 3/16-in. diameter is used, and the machine is set at 500 amp, 30 volts. It takes nearly five minutes for the table to make one revolution and complete the fillet weld. After the outside weld has been made, the wheel is turned over and welded on the inside in the same manner and with the same equipment.

Moving up again to Machine 3, we find still another change, for this unit has now been switched to the production of front frames for dozecasters (Fig. 5). Ten submerged-melt butt welds without backing are needed on this boxlike structure, which is about 7 inches square and has two bends to complicate production. The welds are made at a speed of 20 ipm, using 3/16-in. wire and a setting of 600 amp, 30 volts. The completed front frame measures about 5 ft long, and it will be joined manually to dozecaster side frames manufactured on Machine 1.

Flame-Cutting and Bending

In Fig. 6, we find an operator cutting off corners of 8-in. channel pieces that are to be used on the same dozecaster front frames. This cutting is done in a separate building from the main plant. The operator, it may be noted from the picture, is doing a very neat job of slicing off the diagonal corners with a hand cutting torch. He makes five cuts on each piece in about 25 seconds per cut, which gives him an approximate cutting speed of about 10 ipm. It would have been difficult to rig up a machine set-up that would be as satisfactory for this particular odd-shaped piece.

In the same little building, a multiple-torch machine (Fig. 7) is shape-cutting four parts simultaneously from ½-in. plate. These parts are sheave side plates for a four-wheel scraper. Cutting is done at a rate of 20 ipm, using standard heavy-duty torches with an acetylene pressure of 9 psi and an oxygen pressure of 40-50 psi.

Cutting is only one of the uses which Gar Wood's road machinery division has found for oxygen and acetylene. Looking at Fig. 8, we see a multiflame head engaged in heating a dozecaster side frame prior to a forming operation. After the part has been heated sufficiently, it will be placed on a blacksmith press and pressed into shape hydraulically. The dozecaster front frame shown in Fig. 5 was also formed in this manner.

The heavy-duty heating torch in Fig. 8 consumes 250 cu ft of acetylene per hour. This method of heating is used in lieu of a forge for bending and forming operations; it gives better control and is faster and more convenient than forge heating.

Flame-priming heads are sometimes employed for the removal of rust and scale when particularly heavy. In general, however, plate is not cleaned prior to welding but welded in the "as-is" condition.

Manual Welding

Though little has been said so far about manual arc welding, it is enormously important. The parts prefabricated at the three submerged-melt welding stations are stocked in piles until needed, when they are carried by hoists to positioning fixtures for subassembly by manual welding. A typical subassembly job is the joining of the two dozecaster side frames to the front frame seen in Fig. 5. This task is performed on a large positioner that permits a maximum amount of downhand welding. The same positioner is used for other subassembly jobs, depending upon the production schedule.

To save valuable floor space and

(*Continued on page* 60)

DESIGN is first step in flatware manufacture. The designer is Allan Adler, Hollywood silversmith

CUTTING BLANKS for spoons from sheets of sterling silver. Blanks are simple rectangular strips

FORGING BLANK by hammer blows to create the section dividing the spoon bowl from the handle

Silver-Brazed S

Magic torch of Allan Adler helps convert flat sheets of sterling silver into exquisitely wrought table service

BY FRED M. BURT

OVERLOOKED and unknown to most of us are the contributions of the welding industry towards objects of art. One example, though highly utilitarian in nature, is the custom silverware being manufactured by the silver master of Hollywood, Allan Adler.

Adler's group of silversmiths includes probably a majority of America's hand-forged spoon makers. The skills required for this type of craftsmanship are not quickly attained, and the profession becomes a lifetime occupation. The majority of these craftsmen were apprenticed under their fathers, who had inherited their love for silver making from their forebears. Adler himself, though in his early thirties, has had his own shop since 1939, and behind his own talents of designing and craftsmanship are the experiences of generations of men engaged in silver making.

It is necessary to mention a few technical terms. The tools of the table such as knives, forks, spoons, tongs, ladles, scoops, servers, etc., are known as flatware. Containers such as tea sets, coffee sets, trays, vases, candlesticks, ewers, steins, pitchers, sauce boats, etc. are called hollow ware. Both types of products are formed from sheets of from 14 to 22 gauge sterling silver, a 92½% pure silver (coin silver is but 90%). A typical sheet size is 48 by 15 in. Softer annealed silver comes in rolls of any desired width and length, and the silver for larger units such as trays will be ordered in exact blank sizes.

Basic Processes

Heavier gauges, such as 0 to 4, are used for knife handles; ¼-in. square bars may be used for tips soldered on; half rounds and rounds also have their uses. These bars or "wire" as they are known to the silver trade are figured by rolling them through dies or reduced in size or made into different contours by drawing them through drawing dies.

A silver tube is made by cutting a flat strip to proper width, hammering it into rough form in a groove in a metal plate, and silver brazing the edges together. The tube is then pulled through a draw plate to give it smoothness and precise diameter.

Surface Finishing

A tray is hand wrought by hammering a flat blank of silver to rough contour in a wooden form with a steel forming hammer. Final surface finishing is done with planishing hammers on a "stake" or smooth steel base placed in a vise. These hammers, which come in different sizes and shapes, were forged by old-time blacksmiths; some in use here are 20 years old. The planishing or surface-smoothing starts at one point, and is worked from there out to all parts of the unit to eliminate possibility of warping or distortion. The tray edges are given a smooth, rounded finish by silver-brazing a beading wire around the circumference.

The dimensional outlines for the various silver products are scratched on the flat surfaces of the sheets, and the blanks are hand cut to shape with straight or curved silversmith shears. Heavier gauges are cut on

SHAPING SPOON BOWL. Material is now of the desired thickness but flat. Bowl is formed later

DECORATIVE TIP is brazed to end of spoon handle, using an air-gas torch and silver filler wire

RECESSED BLOCK of eastern maple is used to form the spoon bowl. Careful hammering is needed.

Silverware

bench shears. Round sections for hollow ware are cut on circle shears. Curved cuts are also made on a power nibbler.

Spinning to Shape

When a piece of silverware is ordered, a coffee pot for instance, a rough drawing is made showing plan and side elevation views. A seasoned (7 years) block of eastern maple of proper size is then turned to the required shape on a turning lathe with wood-cutting tools. This shape is centered on the turning lathe to serve as a male drawing die.

A 10-in. diameter circle is cut from 8-gauge silver sheet, and this is mounted against the formed shape on the turning lathe. As the lathe is revolved at the proper speed, the coffee pot is spun into shape in the same general manner that a potter molds pottery on his wheel. Steel tools, however, replace the potter's hands.

Since silver work-hardens rather quickly, the piece being spun must be taken off the lathe from time to time and annealed (softened) with a torch flame. A shallow bowl will require about three annealings, a water pitcher seven.

All work requiring the wooden forms and storage of chunks of wood is in air-conditioned rooms that are kept moisture-free and at even temperature.

The spout of the coffee pot is hammered into form in one piece, smoothed out and cut into halves. These halves are silver brazed together and then soldered to the bowl. The base is spun out of a flat piece of 12-gauge silver, and the center is cut out. The decorative leaves that attach the base to the bowl are shaped by hand; the veins are chased in; the leaves are formed by hammering them into shape in a wooden form. The leaves are first silver brazed to the base and then the bowl or body is set within the leaves and soldered to them.

Brazing Alloys

The silver-brazing alloys used in such work come in three different melting points: 1,325 F, 1,390 F and 1,425 F. The first is for general brazing of handles and mounts. The "medium" solder is also a general brazing alloy and allows a safe margin for use with the first alloy. The "hard" or 1,425 F alloy is good for seams and for use in making hollow ware.

As an example of how the three types are used, the non-adjacent seams are brazed first with the hardest alloy. The next brazing job on any piece of silverware is done with the medium alloy so that the heating for that job will not disturb the previous joints. Final work is done with the alloy of lowest melting point.

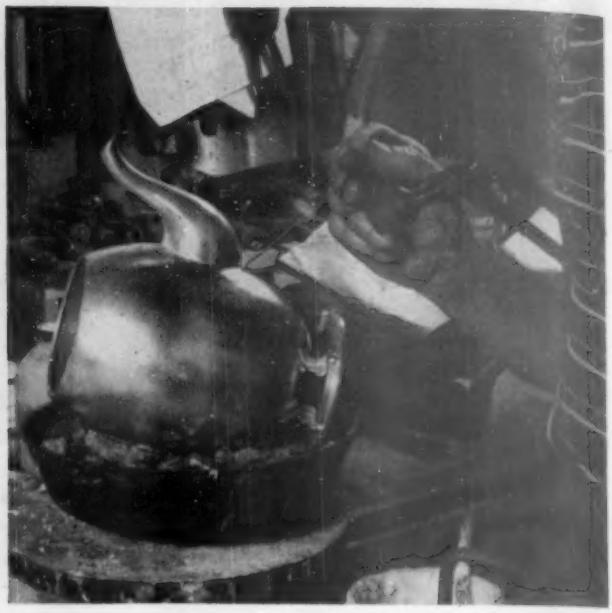
Brazing and annealing are done with air-gas torches. A 6-in. torch producing a flame ¾ in. long (maximum size) is used for most of the brazing, and a 9½-in. torch producing a 9½ in. flame is used for heavy-duty brazing and annealing.

All surfaces to which the silver-brazing alloy is applied must be thoroughly cleaned. This can be done quite well with emery paper. The cleaned surfaces are then coated with borax paste (made from borax granules and water) or a proprietary flux liquid at 1,100 F. The flux serves to protect the surfaces from oxidation as the heat is brought up to the point where the silver-alloy wire can be applied. This is highly important. If the silver alloy is melted on an oxidized surface, it will not flow over it but will ball up at the edge.

Because of capillary action, the silver alloy will flow evenly and rap-

Hollow ware is spun cold. Spouts and handles are added by silver brazing

HOLLOW WARE necessitates different production technique. Here handle is silver brazed to a cream pitcher



COFFEE POT rests on a bed of pumice stone while the spout is being added. It looks easy—but isn't

idly (no matter how tightly the abutting surfaces are compressed together), filling the interstices (no matter how minute) and completely coating all of the areas of the interfaces. Upon cooling, the alloy freezes with an integral and permanent bond. This type of brazing sounds and looks easy, but it just cannot be done except by fully experienced craftsmen.

Making a Salad Fork

Let's take a salad fork as a flatware example. A 4 by 11/16-in. blank of 8-gauge sheet is cut to size and then scribed to show the 17/8-in. length for the tines and 21/8-in. length for the handle. Hammer indentations are made on the sides to show the demarcation lines. The piece is then softened with the larger size of torch on a bed of pumice stone. The handle is hammered into shape from the side with a 5-lb forge and peen hammer, gaining thickness in the shank. It is then peened with the other side of the hammer to gain length. Finally, the peen marks are hammered out. By this time, however, the silver has become work-hardened and must be annealed. The fork is hand forged to size with occasional guidance from a copper pattern. The surface is finished by planishing.

A tip for the scroll or other design is brazed on at the end of the handle. After the tip is added, the handle can be hammered and lengthened while it is at the same time being work-hardened to make it strong and unbendable for its future use. The hammering or forging of silver quickly gives it this quality, and annealing just as quickly renders it soft and pliable. However, expert craftsmanship is required to finish with the proper distribution of work hardness, at the same time forging the piece to the required form and dimensions. Extra thickness, it should be noted, is maintained where greater strength is needed.

Tines are hand cut in the fork with a circular saw, after slot locations have been scribed on the surface. The details are hand filed with the assistance of a belt sander.

Forging Silver Spoons

Under a speed hammer, spoon blanks are so expertly flattened that there is no thinning of the edge. The hammer head is rubber cushioned and the heavy oak arm gives a resilient flexibility that likens the successive blows to the blows of the human arm. The blanks come out of this operation well work-hardened and require a torch annealing. Tips are silver brazed to the ends of the spoon handles, and Georgian scrolls are formed on the tips under a 100-lb drop hammer. The flash is then filed off; the detail filed in. Spoon bowls are hammer-formed in recesses hollowed out in forms of persimmon, eastern maple or lemonwood. They are finished in lead molds.

A power-driven rotary file is also used in the grinding of certain units to size; edges are smoothed on a rubber grinding wheel with an abrasive molded into its body. Other equipment includes the 100-lb drop hammer with Kirksite molds, a trip hammer, drill presses rolling mill, milling machine, polishing lathe and 10-ton hydraulic press.

In the final finishing, the buffing is done with walrus hide and laminated sheepskin wheels, using oil impregnated with pumice as an abrasive. The spoons then go to the cotton, flannel or wool polishing wheels using rouge or tripoli. A mild caustic degreasing cleaner bath follows; before drying, the silverware surfaces are run over a soft wire-brush wheel, which puts on the desired satin finish by minute, indiscernible scratches, all running in the same direction. If the silver ware is then scratched in service, the scratch cuts across the tiny parallel abrasions and can be polished out.

COMPLETE Gasweld OUTFITS

FOR ALL CUTTING AND WELDING JOBS

A Lightweight Outfit for Light, Fast Welding

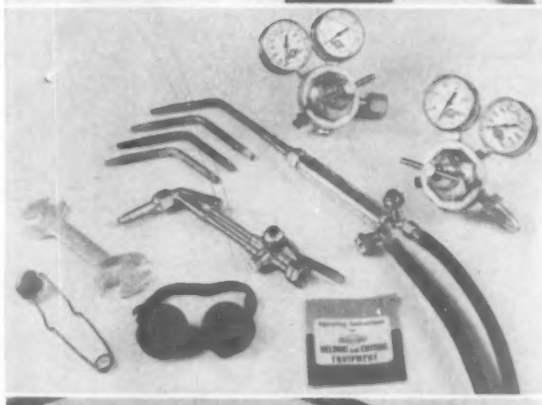
Developed especially for the aviation industry where its light weight, perfect balance and accurate control makes precision welding of aluminum and light gauge materials possible without burning.

Adding the WC-10 Cutting Attachment completes one of the finest outfits available.

AV-10 LIGHTWEIGHT WELDING OUTFIT

Includes AV-10 Gooseneck Welding torch supplied with four tips as selected from Nos. 1 to 6, Model RO-88 Oxygen Regulator, Model RA-88 Acetylene Regulator, One pair WM-25 Safety Spark Lighter, One RF-77 Combination Wrench, One pair WM-6 Goggles and Two 12½-foot lengths of ⅜ hose.

Complete Outfit **$59.00**
WC-10 Cutting Attachment Only **$16.50**



An All-Purpose Outfit for General Work

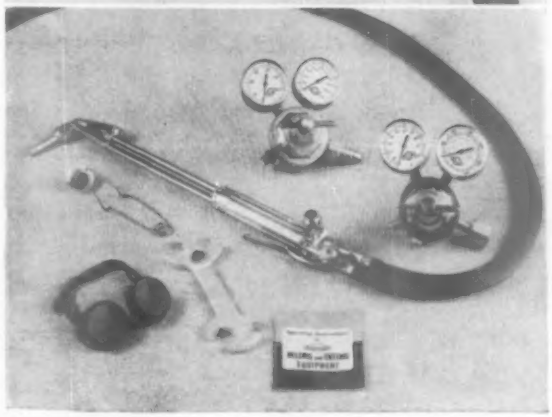
Recommended for job shops, garages and other shops where a wide range of welding is done. The torch is of rugged construction, is 17 inches overall and weighs 24 ounces.

Addition of an WC-20 Cutting Attachment (Available at extra cost) makes this outfit suitable for many uses . . . and ideal for field work where portable cutting and welding equipment is needed.

WG-25 GENERAL WELDING OUTFIT

WG-25 24-oz. Gooseneck Welding Torch supplied with four tips as selected from Nos. 1 to 6. Outfit includes: Model RO-44 Oxygen Regulator, Model RA-44 Acetylene Regulator, One Pair WM-6 Goggles, Two 12½-foot lengths of ¼" hose, One WM-25 Safety Spark Lighter and one RF-77 Combination Wrench.

Complete Outfit **$72.00**
WC-20 Cutting Attachment Only **$20.00**



A General Cutting Outfit — for Precision Work

One of the finest cutting torches made. Head and rear end are forged for long life. This finely balanced torch makes cutting easier and assures more accurate work. Choice of 80° and 90° head (specify angle desired when ordering).

HC-31 GENERAL CUTTING OUTFIT

Model HC-31 lever-controlled cutting torch with one tip. Complete outfit includes: Model RO-22 Oxygen Regulator, Model RA-22 Acetylene Regulator, Two 25-foot lengths of ¼" hose, One pair WM-6 Goggles, One WM-25 Safety Spark Lighter and One Combination Wrench.

Complete Outfit **$83.00**

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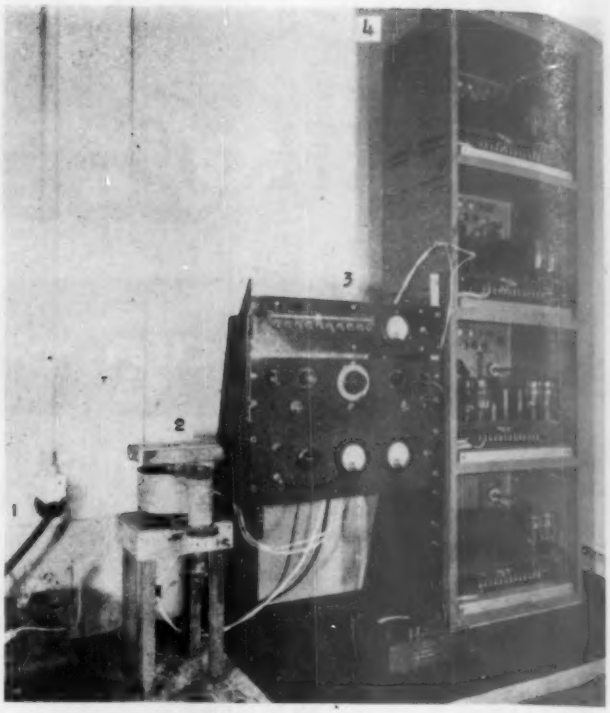
Fluxless Soldering of Aluminum

"Sonodizing," newly developed technique for the application of magnetostrictive vibratory forces to soldering of aluminum alloys, may find application to a number of aircraft problems and provide metal-working shops with a useful tool

BY KENNETH D. KAHN

Process Engineer, Lockheed Air Service, Inc.



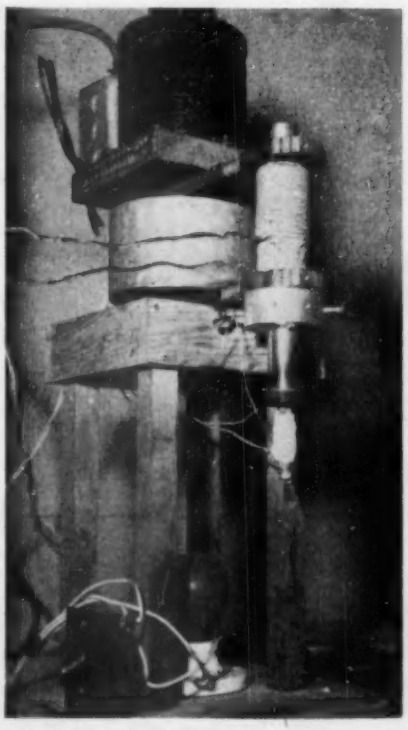
MAGNETOSTRICTION equipment. (1) 24-volt, 150-amp battery to supply current for polarizer coil; (2) transducer; (3) control panel (milliammeter on table shows amplifier power); (4) 200-watt amplifier bank

THE SOFT soldering or "tinning" of aluminum alloys by commonly used soldering procedures has presented problems that tend to limit applications of aluminum soldering and even preclude its adoption as a production method of attachment in the aircraft industry. It has long been recognized that many useful applications would result if light alloy tinning of aluminum could be accomplished in a manner comparable to that done with copper and ferrous alloys.

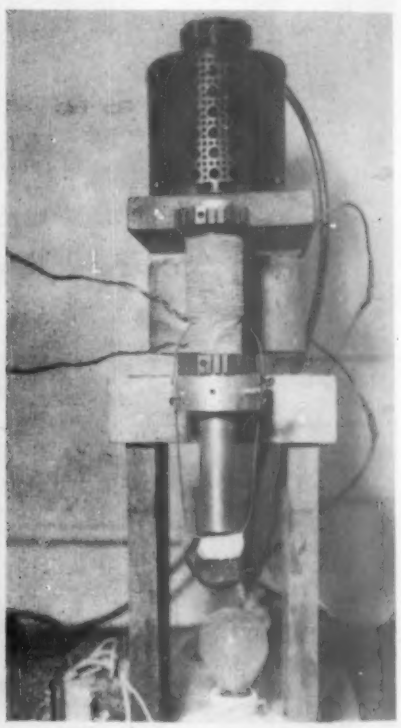
VIBRATION ONE ANSWER

Studies of the use of intense vibratory forces to the soldering of aluminum and its alloys have been made in the engineering research laboratories of Lockheed Aircraft Corp., Burbank, Calif., by two of the company's research chemical engineers, Frank W. Thomas and Eli Simon.

When the possibility of fluxless soft soldering was considered, it appeared of fundamental importance to be able to disrupt the oxide coating while surface was in contact with the molten solder. This would allow instantaneous alloying of the metal with the solder before reoxidation of the aluminum could occur.

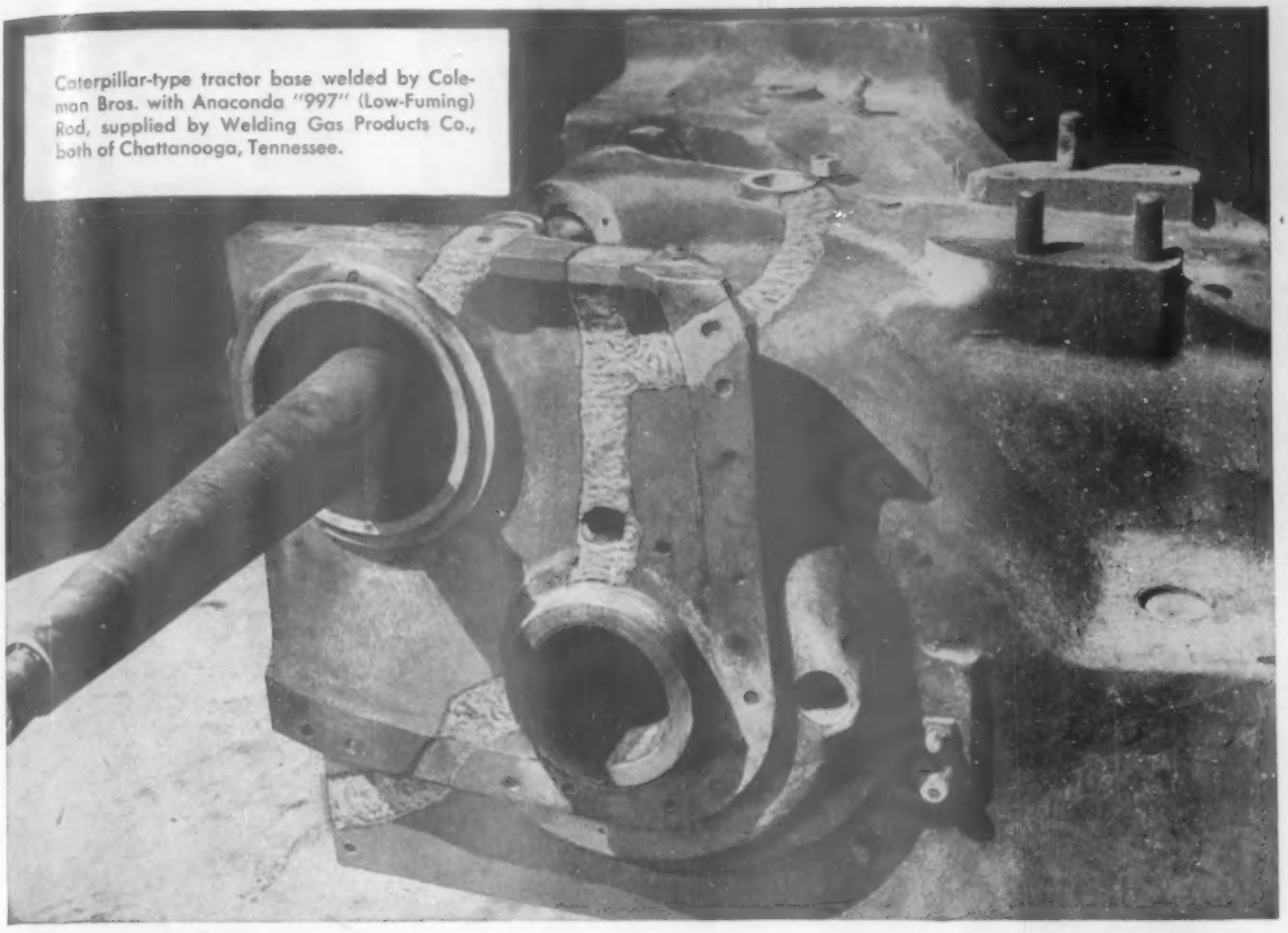


SOLID TIP for sonodizing is mounted in an oscillator coil



BRUSH-TYPE tip may also be used. It works as well as the solid tip

Previous work by Thieman had shown that such oxide films are readily removed by immersing the aluminum in molten solder subjected to intense vibration. The vibration may be accomplished by magnetostriction — defined by the dictionary as a change in the dimensions of a body when magnetized. The magnetostriction oscillator



Caterpillar-type tractor base welded by Coleman Bros. with Anaconda "997" (Low-Fuming) Rod, supplied by Welding Gas Products Co., both of Chattanooga, Tennessee.

$1,275 AND SEVERAL WEEKS' DOWNTIME SAVED

BY BRONZE WELDING

IT LOOKED LIKE a costly accident when a caterpillar-type tractor in Chattanooga cracked its 2,000-lb. base. A new base would cost about $1,500 with several weeks for delivery. But bronze welding came to the rescue!

Twenty pounds of Anaconda "997" (Low-Fuming) Rod was used in the 67-inch weld. Grinding, preheating and oxy-acetylene welding took only 20 man-hours. Total cost of repair: $225. And the tractor was back on the job in a few days. Moral: If your heavy equipment cracks or wears down—remember bronze welding.

Almost any part made of cast iron, steel, malleable iron, or copper alloys can be bronze welded quickly—at small cost. And well-made bronze welds in cast iron are stronger than the base metal itself.

Furthermore, with the low temperatures used in bronze welding—the weld area surfaces only are usually brought to a cherry red heat. This means less chance for warping or cracking.

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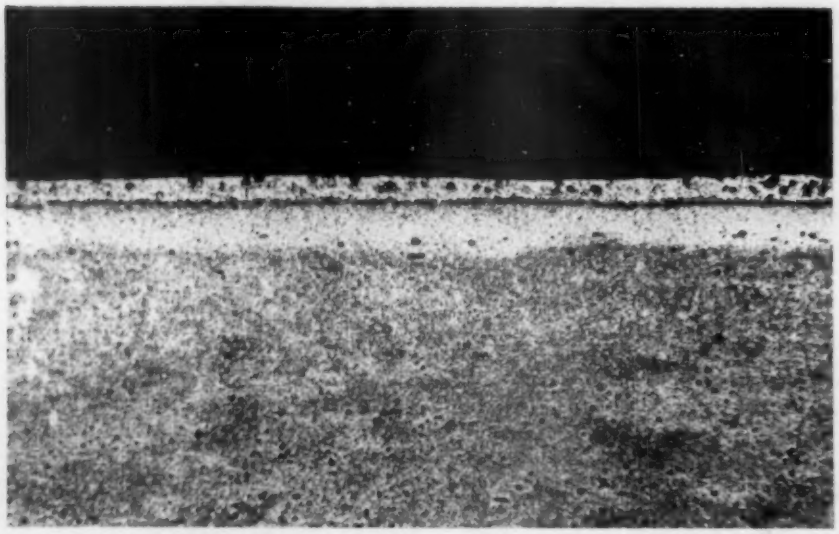
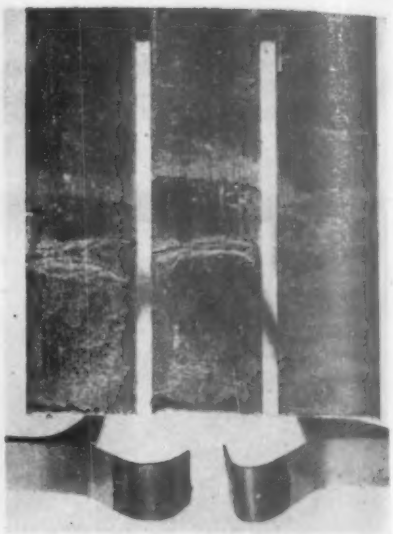


PHOTOMICROGRAPH (200 X) of sonodized panel of 24-ST clad aluminum. Line separating solder (top section) from cladding is a shadow effect



DURALUMINUM PANELS tinned by the sonodizing process

is based on the principle that when a bar of magnetic material conducts a magnetic flux it lengthens or contracts longitudinally. This mechanical oscillating system can readily be coupled magnetically to an electronic tube that supplies the power for sustained oscillation.

The fluxless tinning of aluminum and its alloys through the application of magnetostrictive forces to a special soldering iron has been designated as "sonodizing." Although sonodizing eliminates the use of a flux, a word of caution is necessary. If wide enough differences of surface potential or overvoltage characteristics exist between the metallic boundaries — solder, interalloy and base metal—corrosion susceptibility still exists, and protection precautions that are commensurate with the conditions of exposure must be taken.

Tip Soldering Iron

In order to establish satisfactory procedures for fluxless tinning of aluminum alloys, chromeplated steel, stainless steel and magnesium alloys, the magnetostrictor had to be modified so that it could serve as a soldering iron. Selection of suitable equipment required the examination and analysis of the characteristics of several types of existing vibration generators: magnetostrictor, electromagnetic generator, gas current generators and quartz crystal oscillator.

The transducer of the magnetostrictor can be fabricated so that the most critical part, the vibrating tip, is capable of withstanding direct immersion in molten metals such as solders. This means that the tip can be used directly as a soldering iron. One type of magnetostriction generator has an effective frequency range of 1 to 50 kc and amplitudes of 0.0001 to approximately 0.001 cm, which is the rupture point of nickel, and power range of 75 to 10,000 watts, oscillator coil output. Any smaller unit is impractical where mechanical effect of vibration is desired.

Simple Maintenance

Transducer efficiency, which is the measure of oscillator coil power output available as mechanical power, is seldom over 15%. Operating temperature of the tube within the oscillator coil is the Curie point of the metal (point below which it ceases to be paramagnetic—300 F for Invar), although tip temperature of 800 F can be maintained. Though advanced knowledge of electronics is essential to construct the force generator, no skill in electronics is required for its operation. Maintenance routine is confined to replacement of tubes and transducer metal rod or tube undergoing magnetostrictive forces. The acoustic intensity of the 2,000-watt unit is approximately 15 watts acoustic power. and the cost of the unit ranges from $400 to $2,500 according to power rating.

The electromagnetic generator is simpler and less costly than the magnetostrictor, but it is applicable mainly to low-frequency work with large volumes of fluid on a continuous basis. Similarly, the gas current generator such as the Galton Whistle has some desirable features, but it has a transducer efficiency of only 5% and does not possess the ease of control characteristics of electronic devices. The quartz crystal oscillator is suitable for some work which requires precise control, but it is unsuited to the sudden temperature changes requisite for fluxless soldering, and heat cannot be applied to the vibrator itself. Maintenance also is costly if the crystal breaks frequently.

To proceed with sonodizing, power amplifier, oscillator and polarized coil circuits are energized; transformer impedance is adjusted for maximum output. The oscillator is tuned to give maximum vibrational intensity. The capacity across the exciter coil is adjusted to give maximum deflection of the milliammeter in the exciter coil circuit. Power is controlled by adjusting gain on the amplifier bank. Field strength of the polarizer coil in the transducer circuit is altered to give maximum magnetostrictive effect. Invar tubes require 12 volts at 3.2 amp for maximum power.

After the circuit is stabilized, the control is set to give proper temperature. A 16-ohm, 500-watt Nichrome heater heats the sonodizing tip. The solder is then applied and allowed to flow around the tip and onto the

LOOK FOR THAT SHAPE IN THE *Lukens Manual*

No need to design a special shape when a Lukens Head-Shape will fill the bill. You get into production faster because dies are already available for forming it. You avoid expensive die charges and, in many cases, save on machining time.

Detail dimensions on 3,868 standard head-shapes are given in Lukens Manual No. 1, "Flanging and Pressing". You have only to transfer them to the drawing of the tank, pressure vessel, machine or other product you are planning. Hundreds of manufacturers of all kinds of equipment have found Lukens Head-Shapes a short cut to speedier production and lower costs.

Lukens produces head-shapes from four inches to over twenty feet in diameter. Thicknesses range from $\frac{3}{16}$" to six inches. Lukens makes head-shapes of carbon and alloy steels, including stainless; nonferrous metals such as nickel, Monel and Inconel, aluminum and silicon bronze; and the widest range of clad steels available anywhere.

May we quote on your head-shape requirements? Bulletin 433 shows the sizes and gages of carbon steel heads regularly stocked and ready for immediate shipment. Lukens Steel Company, 416 Lukens Building, Coatesville, Pennsylvania.

LUKENS HEADS

...of interest to you.. *"HEAD WORK", a 16mm motion picture in sound and color, on spinning and pressing of Lukens Heads is available without charge. Running time: 27 minutes. Write for a booking date.*

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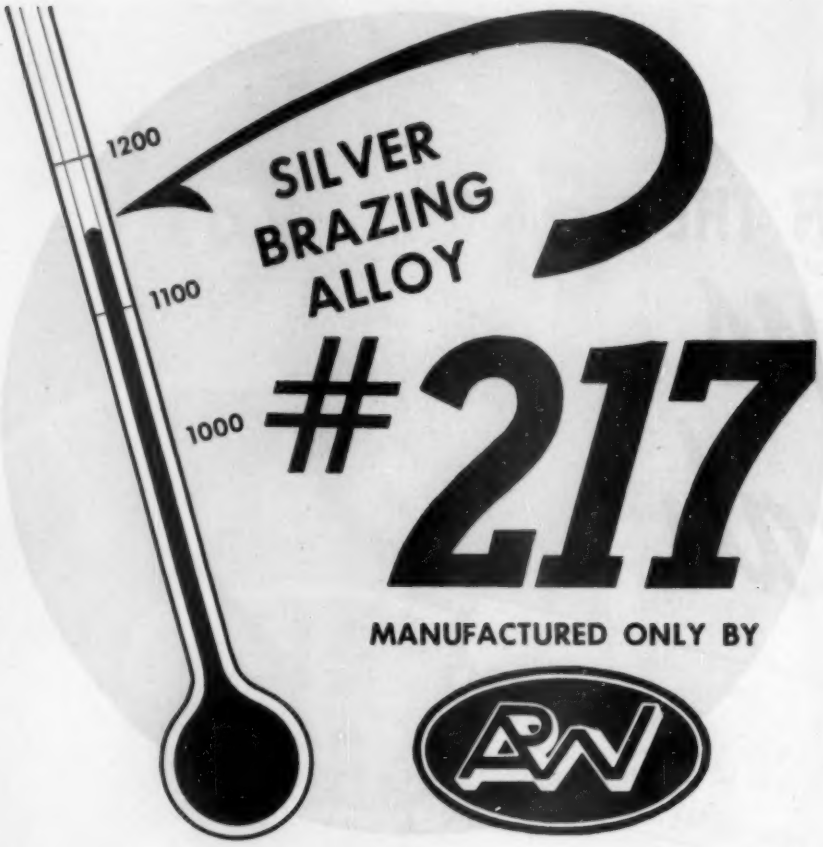

Here's the low temperature silver brazing alloy for real production. With exceptional fast flowing properties at low temperature (liquidus 1195°F) it penetrates deeply and makes strong, leak-tight joints on both ferrous and non-ferrous metals. Economical too — only 45% silver.

APW 217 is the PREFERRED brazing alloy for tough production jobs throughout the refrigeration, air conditioning, automotive and appliance industries. If you haven't tried APW 217, write today for our descriptive folder #45 and let us have your requirements.

We'll be glad to quote without obligation on any quantity, any size, wire, sheet, strip, rings or washers.

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metal to be tinned. The operation produces an intense hissing and chattering noise, which can be used by the operator to gauge the working efficiency. When the panel under the tip area reaches the temperature of melting solder, rapid tinning occurs under the heated tip. Sufficient pressure is applied to the panel to hold it firmly against the tip. Two or more rapid passes of the sonodizing tip generally produce satisfactory tinning. A brush tip, it is interesting to note, works as well as a solid tip with the added advantage of reaching inaccessible areas, scaled spots and scratches. Goggles and respirator should be worn by the operator as the brush or rod has a tendency to throw metal.

With operating characteristics kept constant, satisfactory soldering of aluminum and its alloys has been accomplished, notably 24ST and 75ST alloys. Stainless steel, chromium-plated surfaces and anodized and dyed aluminum surfaces tinned equally well. Stainless steel tinned more easily when a small amount of cadmium was added to the solder as a wetting agent, and the same was found true of chromium-plated surfaces.

Other Applications

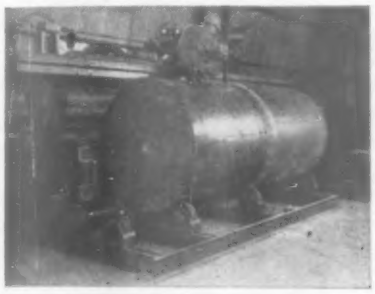
Phenolic strips were metallized with zinc, lead, cadmium and aluminum. Castolin and dyed aluminum tinned satisfactorily, but required longer time than bare alloy surfaces. Ferrous metals such as mild steel and molybdenum steel do not tin readily, requiring greater energy output and greater solder wettability. Aluminum aircraft generator cable tips and lugs were tinned and then sweated together, resulting in very low contact resistance. 57-Magnesium was not satisfactorily tinned, due probably to the high solder temperature that had to be employed.

Some of the practical applications of intense vibratory forces might be listed, indicating new and improved solutions to existing problems in the metal shop: joining of duraluminum tubing, assembly of duraluminum chassis for electrical units, hot air duct assembly, replacement for metal-to-metal adhesives, airfoil smoothing and tinning anodized duraluminum surfaces.

REED ENGINEERED JIGS and FIXTURES for AUTOMATIC WELDING

PORTABLE TURNING ROLLS

These rolls are built with variable speed drive and are available in 3-ton, 6-ton, 12-ton, 25-ton and 50-ton sizes. The 3-ton unit illustrated above sells for $875.00 complete with one power and one idler unit F. O. B. factory.



UNIT TYPE TURNING ROLLS

These machines combine both power rotation of work and track support for automatic welding head into one compact unit. Five standard sizes are available for welding tanks up to 10 ft. in diameter.

LONGITUDINAL SEAM WELDER

For high production welding on longitudinal seams, the Reed Horn Type Jig has no equal. This unit combines a copper backup with a mechanical toggle linkage to press the seam absolutely flat prior to welding.

The Above Machines And Many Others Are Shown In Our New Bulletin No. 65. A Copy Will Be Mailed At Your Request.

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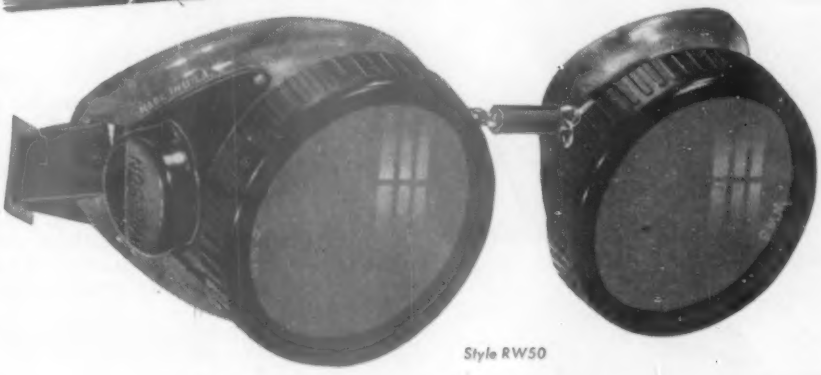
In the Glare of the Torch— think of WILLSON

Style CW60

ROOM WANTED FOR SPECTACLES? . . . There's comfort for wearers of prescription glasses in Willson Cover-Alls.* And the adjustable leather bridge rests lightly on the nose without pressure. Willson-Weld* lenses in the shade you specify, of course.



Style RW50

GAS WELDERS GO FOR IT . . . Assured protection of Willson-Weld lenses and comfortable face fit make this goggle day-in, day-out favorite for flame cutting and cleaning as well as welding. Indirect ventilating ports exclude glare.

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FOR EYES THAT LEAD A DOUBLE LIFE . . . From welding to chipping with a flip of the wrist! Willson-Weld lenses in separate frames flip up to leave eyes protected by clear, Super-Tough* lenses.

For complete information on these products and their application, as well as many more eye and respiratory protective devices, get in touch with your nearest Willson distributor or write us direct.

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Free samples gladly supplied to quantity users for test. Give details of your welding operation so suitable electrodes can be sent. You be the judge!

CARBON BRAZING TIPS *that last 3 to 4 times as long!*

Cut resistance welding or brazing costs! On a typical elevated temperature job where ordinary carbon electrodes were changed hourly, Stackpole Electrodes processed with the famous anti-oxidation "F" treatment lasted all day. Three or four times longer life on the average job is an extremely conservative estimate of the saving involved—and Stackpole tips require dressing only about one-third as often! WRITE FOR SAMPLES. State shape and size required. Mention company connection.

EASY TO USE WELDING PASTE

Stackpole Welding Paste does not blister, spall, or crack! Use it in place of, or in combination with plates and rods. Use it to back up or dam material for complicated shapes. Use it to protect threaded holes or to hold plates and rods in position while welding. Stackpole Welding Paste saves time when time counts most, because it is easy to handle, easy to fashion in the desired shape quickly. Available in sealed metal containers in 1, 2 ½, and 5 pound sizes.

STACKPOLE

EVERYTHING IN CARBON BUT DIAMONDS

STACKPOLE CARBON CO.

ST. MARYS, PA.

WELDING AT GAR WOOD

(*Continued from page 49*)

give additional safety, manual arc-welding transformers have been mounted on beams running along the outer building walls at a height of about 15 ft above floor level. These transformers are located at intervals convenient to workers. The method by which current may be adjusted with the transformer so far above the worker's head is shown in Fig. 9. The extension handle is of the company's own design.

While some of the company's 105 arc welders are used for subassembly purposes, others are employed to join the several subassemblies into a completed bulldozer, dozecaster, ripper or scraper. This unit is inspected visually and tested for clearances; it is then rolled to a separate building and spray painted a bright-orange color. Finally, it is taken outside and left in the yard to await shipment.

Broken Press Repaired

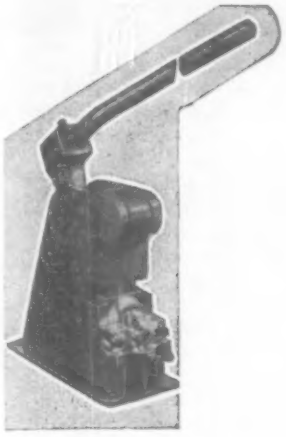
Manual welding has also been found an indispensable aid to plant maintenance. An excellent example is the 300-ton press brake earlier mentioned. This colossal machine cracked on both sides of its base, each crack being through a 2½-in. thickness of steel plate. Large-size flame-gouging tips were used to gouge out 18 or 20 in. of broken metal on each 2½-in. plate, and the cracks were then welded (Fig. 10) without preheating or stress relieving. Approximately 200 lb of 5/16-in. E-6012 (all-position) electrodes were consumed.

This big repair job was finished in two days. If it were not for welding, it would have been necessary to order a whole new bed for the press, taking months to deliver.

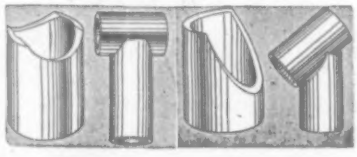
The Mattoon plant operates only one shift and has some 250 employees, including 94 production welders, 77 assemblers, flame-cutting operators and machine operators, 74 non-production workers and 17 office workers. L. C. Hulse is plant manager, Frank Eagan, superintendent, and William Potter, general foreman; it is these three men who are mostly responsible for the many clever production ideas that have been developed.

NOTCH
TUBING AND PIPE ENDS
EASILY
IN 5 SECONDS

ARC·FIT



THESE RESULTS
IN POWER OR HAND PRESS



Arc-Fit is a notching unit for preparing pipe or tubing ends in making welded or brazed tubular joints in less than 5 seconds. Arc-Fit is a production tool that will cut your production costs.

- Arc-Fit can be utilized in any power press.
- Arc-Fit can be furnished for any size tubing or pipe.
- A hand press can be supplied with Arc-Fit units for shearing pipe or tubing sizes 2 inches or under. For sizes over 2", angular cuts other than 90°, and slotting operations. Quotation furnished on request.
- Arc-Fit does not deform pipe or tubing. No grinding or finishing operation is needed.
- Engineers can now design for tubular construction and cut costs.

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TAYLOR MADE *by* TAYLOR-WINFIELD

wheel housing seam welded *in 15 seconds* (RESISTANCE)

PRODUCT—Rear wheel housing for a new automobile design.

PROBLEM—To weld housing from stamped halves in one-half the time required with conventional or standard seam welder. Material is 20 ga. cold rolled steel.

TYPE OF WELDER—Special series T-W seam welder with dual, roller anti-friction heads and special air operated pivoting fixture.

PROCEDURE—Halves of wheel housing are placed in fixture. Following sequence is fully automatic. One operation of palm button sets up this cycle...(1) clamps work; (2) moves fixture to welding position; (3) brings welding heads down and heat on, as fixture starts to rotate. On completion of weld, fixture automatically returns to unloading and loading position and unclamps completed assembly.

COMMENT—This special seam welder is designed to fabricate wheel housings of such depth and shape as could not be economically or efficiently deep drawn from one piece to like dimensions.

RESULTS—A production of 150 complete wheel housings per hour with an average welding time of 15 seconds per assembly.

Our monthly publication "Weld-It" shows many production short cuts by resistance welding. Request it using your company letterhead.

THE TAYLOR-WINFIELD CORPORATION
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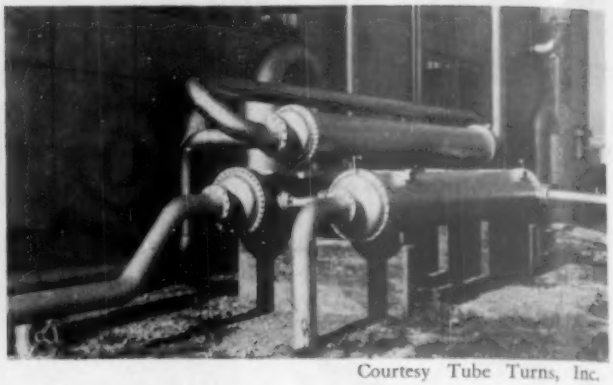
TAYLOR-WINFIELD
RESISTANCE WELDERS

on the job

Courtesy The Baldwin Locomotive Works

PROPANE TANK, designed for pressures up to 200 psi, was tested with 116 resistance-wire strain gauges before it left the shop



Courtesy Tube Turns, Inc.

HEAT EXCHANGERS at Mt. Sterling station. Welded piping and welding fittings were specified for the extensive installation

Strain-Gauge Testing

COMPLICATIONS in the computation of stresses in a 30,000-gallon welded propane tank supported on saddles induced design engineers to use bonded resistance-wire strain gauges to determine the actual stresses under service conditions. In preparation for the test, 116 delta-type gauges were bonded to the inside and outside walls of the tank, waterproofed and wired to control equipment.

The tank, built and tested in the Chicago shop of the Chicago Bridge and Iron Co., is about 67 ft long, 9 ft in diameter and has walls 1-in. thick. The supporting saddles are 12 in. wide and extend 120 deg around the tank. Test positions were at 1 ft, 5 ft, 9 ft and 13 ft from the end seams.

Maximum stresses were found to occur near the top ends of the saddles, but all test positions were shown to be safe under all service load conditions.

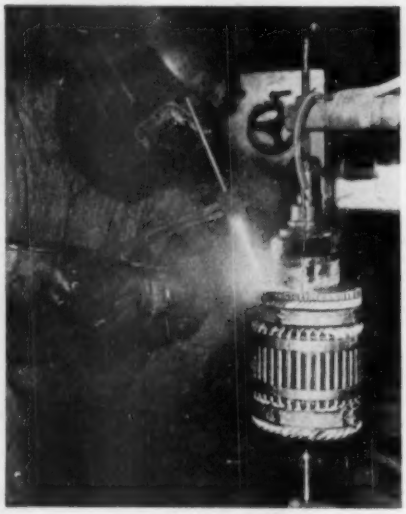
* * *

Copper Welded to Copper

CARBON-ARC welding under a stream of water has replaced soldering in the assembly of electric motors for power industrial trucks manufactured by The Elwell-Parker Electric Co., Cleveland. This eliminates one cause of trouble with motor overload: overheating and melting of the soldered connections. The melting point of copper is three to four times higher than that of solder. It is also higher than the heat generated in an armature in severe service.

In a motor of 3 to 5 hp, as many as 65 separate welds are made, closely, evenly spaced. These connect the tips of the short lengths of wire conductors in the commutator bar neck slots at both ends of the armature coils. The wires are heavy and rectangular in cross-section; placed end to end they would reach to a length of 143 ft.

All wires are insulated up to the points where they are joined, and the insulations must be protected from the welding heat. This is accomplished by means of a water jet. Water is led in a rubber tube to the areas near the electrode, dispersing the excess heat in steam.



UNDERWATER WELDING isn't confined to the ocean. Here cooling water aids in welding electric motor wires

Before welding, the wires are assembled in the armature. The latter is mounted vertically on its shaft on a work bench and rotated by the weldor to bring one connection after another before him. The weldor works with both heat and water, balancing one against the other.

Though more skill, time and cost are required for welding than for soldering, the welded connections are said to make certain longer lives for the motors.

* * *

Model Compressor Station

OHIO Fuel Gas Co. is operating one of the midwest's most modern technically efficient compressor stations at Mt. Sterling, O. Two lines come into the plant from eastern fields, and three go out. Of the latter, one line runs to Springfield, Troy and Piqua, another to Dayton and Cincinnati; the third line is a 20-mile loop. The plant can handle 75,000,000 cu ft of natural gas each 24 hours and has a propane capacity of 1,250,000 gallons. The propane is held in 70 tanks 9 by 70 ft under a pressure of 200 psi and mixed with the natural gas during periods when consumption is exceptionally heavy.

By specifying welding and welding fittings for the extensive piping system, the company's engineers gained the advantages of: smooth changes in flow direction, safety, superior strength, elimination of excessive maintenance, avoidance of shutdowns due to joint leakage.

* * *

Rims Flash Welded

A MOTOR-OPERATED flash welder enables the LaPorte Corp., LaPorte, Ind., to quadruple production of steel rims for tricycle wheels. Now 480 rims per machine-hour are being welded as compared with about 120 rims per hour by the former method. More consistent weld quality is another advantage.

A 50-kva welder is used to join the edges of the rims, which are formed from 16-gauge hot-rolled steel strip. The entire operation is automatic.

Courtesy Progressive Welder Co.

TRICYCLE RIMS are turned out at a rate of 480 per hour on 50-kva flash welder installed at plant of the LaPorte Corp.

Courtesy The Linde Air Products Co.

FOUR SLEEPERS can be accommodated in this welded aluminum trailer

Aluminum Camping Trailer

CAMPING trailers used to be considered luxuries for the well-to-do; now they are becoming permanent homes for those who can't find any other. The compact trailer shown in the accompanying picture sleeps four persons and has a built-in icebox, water tank and grocery space in its storage compartment. Fabricated of 61-ST aluminum, it weighs only 800 lb.

The trailer is 10 ft long, 6 ft wide and 4 ft high from the floor to the roof. Inert-arc welding with argon gas, eliminating the use of flux, was employed on the edge seams, wheel skirts and elsewhere.

* * *

Welding Dissimilar Metals

DIFFERENT portions of a unit frequently require different properties which one alloy alone cannot furnish. One example is a piping system in which part of the piping undergoes a much higher temperature than the remainder. Special alloy steel may be specified for the "hot" portion and less expensive low-alloy steel for the "cold" section. Similarly, the inside of a pressure vessel may be subject to severe corrosion and demand a corrosion-resistant alloy, whereas plain-carbon steel is wholly satisfactory for the outside.

Considerations such as these have impelled the technical service department of the Tempil Corp., New York City, to gather together a great deal of data on the welding of dissimilar metals. This information is at the disposal of any interested party.

The following general rules for ferrous metals are reproduced from a recent issue of *Tempil Topics*:

1. Almost any two ferrous metals (steels) may be joined with 25% Cr-20% Ni electrodes since the foregoing chromium-nickel composition can withstand considerable dilution without affecting weld-metal properties.

2. When welding two kinds of steel, the electrodes may be of the lower alloy composition, provided that it yields a strong, tough weld.

3. A 25%Cr-20% Ni electrode is recommended for joining pearlitic or ferritic steel to an austenitic steel.

4. Preheating is of the greatest importance and should always be done wherever dissimilar metals are to be welded. The minimum should be 200 F, but the preheat temperature should never be less than that required for the most delicate of the two steels to be joined.

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From the raw materials to the finished product, every step in the manufacture of TITAN Bronze Welding Rods is held under rigid metallurgical control. Each melt is subjected to chemical analysis and thorough physical testing. As a final precaution, actual welds are made to test the welding properties of the rods. Our metallurgical inspectors have complete authority, and no rods are shipped unless they have met our high standards of quality. TITAN Welding Rods *must be right.*

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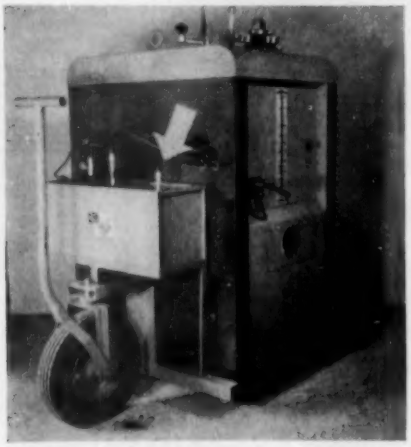


SELF-CONTAINED coolant systems for electrodes built into inert-arc welders

Electrode Coolers

THE Gray Mills Corp. has developed a line of self-contained coolant systems for cooling a-c welding electrodes. Recommended pumping units for this application are of the positive-pressure type and are available in several sizes. Tanks for the water are furnished in 5, 12, and 38 gal capacities.

The Miller Mfg. Co. of Appleton, Wis., is incorporating the systems in "Heliarc" welders such as the one pictured above, which is used for welding non-ferrous metals. THE GRAY MILLS CORP., 1948 Ridge Rd., Evanston, Ill.

* * *

HARD maple solder paddle for auto body shops, etc. It speeds up work

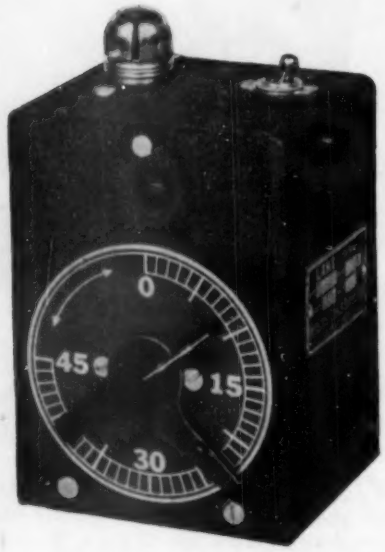
Solder Paddle

DESIGNED for use in auto body shops, a new solder paddle is made of hard maple for long-lasting, clog-free service. It is bailed in tallows to preserve and lubricate it prior to use. Paddle is available with either flat or rounded blade. REMONT MFG. Co., Lombard, Ill.

Heated Respirator

A NEW heating unit for air-supplied respirators assures the wearer of thermostatically controlled warm air even in temperatures of 30 deg below zero. The "Air-line Heater" consists of an electric heater, heat exchanger and thermostat, all enclosed in a rubber covered cylinder measuring 11 in. long by 2½ in. OD. It weighs only 4 lb and may be clipped to the user's belt. MINE SAFETY APPLIANCES Co., Braddock, Thomas and Meade Sts., Pittsburgh 8.

* * *



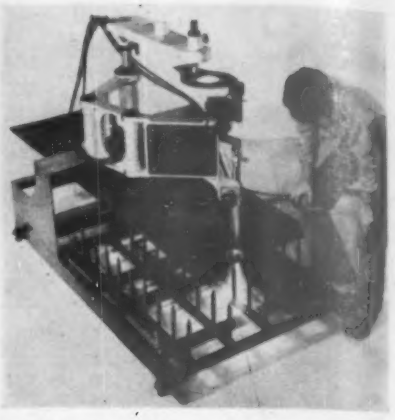
SYNCHRONOUS motor-operated timer turns on a 10-amp load. It is enclosed in a dust-tight metal cabinet

Electric Timer

THIS timer is operated by a synchronous motor and is enclosed in a dust-tight metal cabinet. It has heavy gears and alloy steel shafts, plus a pointer that can be manipulated with gloved hands.

The unit illustrated has a 45-second range control and will turn on a 10-amp load. It will also flash a light at the end to indicate completion. Timers for other ranges are: 60 seconds; 6, 45 and 60 minutes; 4½, 6, 27, 45 and 60 hours.

With a minor change, the timer acts as a time delay, and closes the load circuit at the end of a preset time. A repeat cycle arm is provided. This timer is useful in electroplating, heat treating and other repetitive operations. THE NATIONAL TIME AND SIGNAL CORP., 21800 Wyoming Ave., Detroit 20.



FLAME-CUTTER equipped for spindle or magnetic tracing. It will handle up to 8-in. thicknesses, up to 42 in. circles

Flame-cutter

OHMSTEDE MACHINE WORKS, 897 N. Main St., Beaumont, Tex., is now producing its SC-42 flame cutting machine for larger ranges of work. It may be set up for spindle tracing with plywood templates or for magnetic tracing with steel templates. The current for the d-c electromagnet used with the steel template is furnished by a rectifier on the outer arm.

Cutting speed can be adjusted from 3 to 30 ipm. Oxygen and acetylene supply is carried through hoses to a hose block at the rear of the machine to prevent interference with cutting.

Some specifications are: maximum thickness of cut with standard tip, 8 in.; circle cutting range, 0 to 42 in.; straight-line cutting range, 89 in.; power source, 115 volts, a-c or d-c; overall dimensions, 36 by 72 by 59 in. high.

* * *

MOLY-IRON welding rods have greater strength and finer grain characteristics

Moly-Iron Rods

CAST-IRON welding rods alloyed with molybdenum are now being offered for uses where greater strength and finer grain are desired. They are suitable for fabricating and rebuilding of castings.

These rods have a slightly higher melting point than cast iron, but the weld metal is more fluid when molten. They are said to produce more easily machined, non-porous welds than plain gray-iron rods. The puddling process is not necessary nor recommended because the weld metal flows like a low-carbon steel rod, states manufacturer. THE CHICAGO HARDWARE FOUNDRY Co., 1247 Engineering Building, North Chicago, Ill.

These pictures SHOW you...

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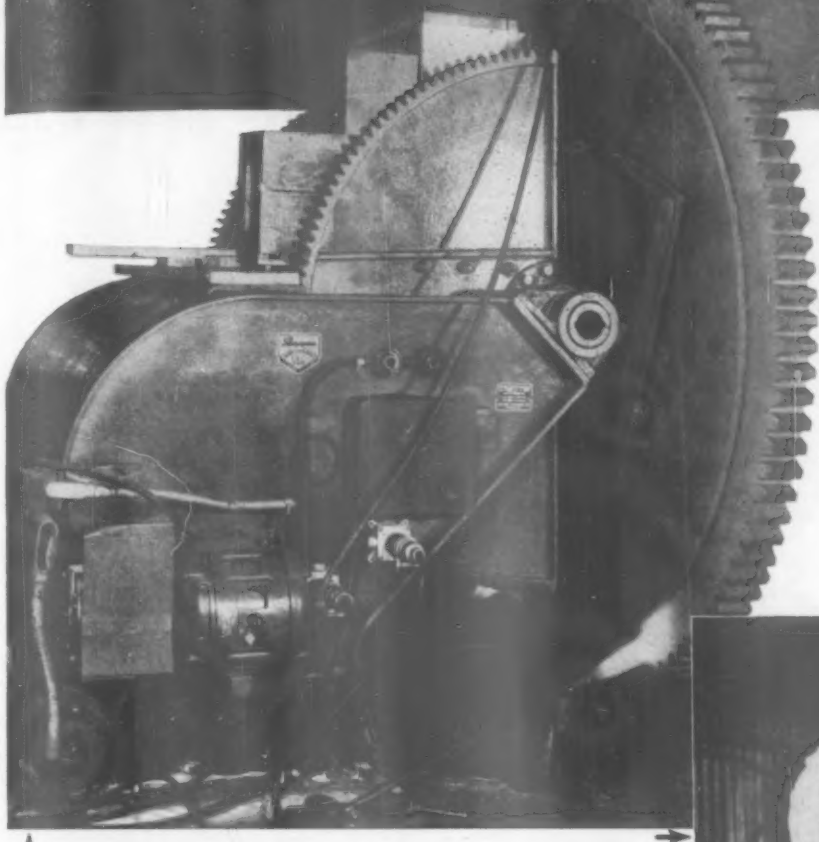

how Ransome "DOWNHAND" welding positioning

- ups production 50%
- cuts work in half
- gives better, neater welds
- reduces rod waste 5-7%
- makes work safer

Ransome 12 Ton Welding Positioner at Marion Power Shovel Co., Marion, O. Gear being welded and preheated at same time.

Ransome 2500 lb. Welding Positioner being used with automatic welding head at Wooldridge Mfg. Co., Sunnyvale, California.

RANSOME POSITIONERS . . . constant or variable speed rotation through full 360° in either direction . . . wide welding speed range . . . 135° tilting hand or motorized as required . . . permits Downhand welding at any angle . . . capacities 100 lb. to 40,000 lb.

RANSOME TURNING ROLLS . . . standard capacities 4½ to 45 tons, stationary or self-propelled, also larger sizes available.

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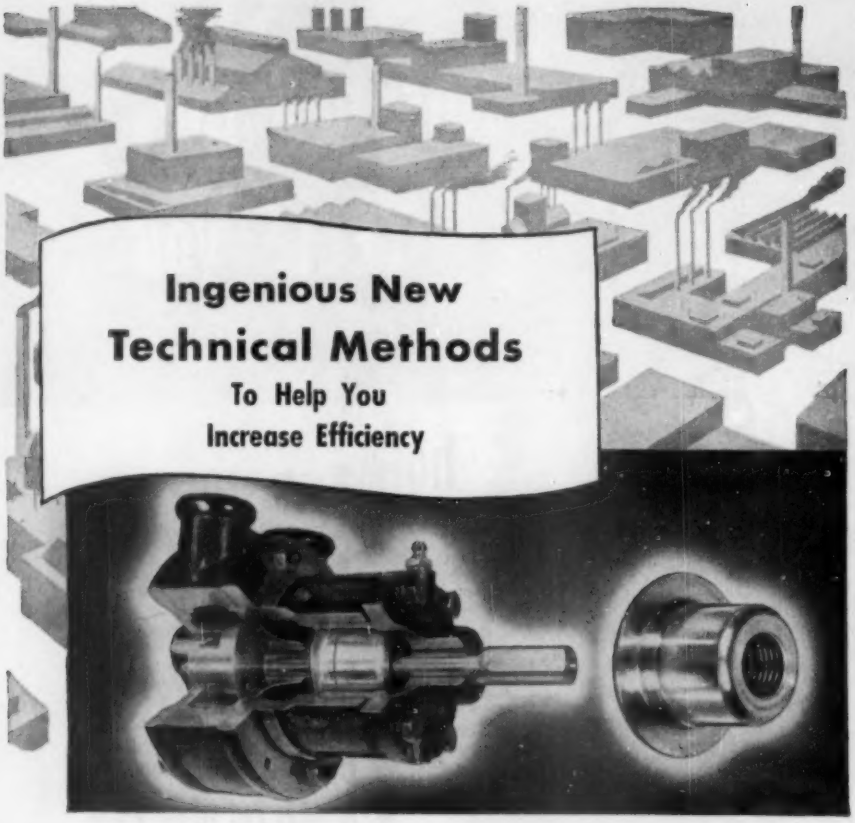
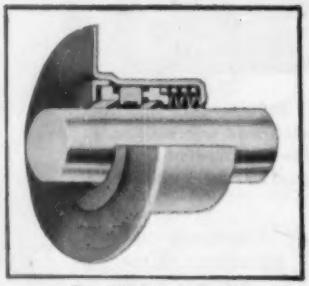


New Cartridge Seal Solves Rotating Shaft Sealing Problems

Stepped-up efficiency in sealing of rotating shafts can now be accomplished with a new Cartridge-type Seal mounted on the shaft.

The Cartridge-type Seal shown above is mounted within a Tuthill Pump. The seal contains all parts in one housing cup and insures positive double sealing. A high grade permanent lubricant is contained within the inside chamber of the housing.

Surfaces within the Cartridge-type Seal are lapped flat to within a few millionths of an inch to insure perfect mating. And, being a complete unit, only one mounting face is necessary. Clamps are eliminated, and adjustments or alignments are not required. Simply push the Cartridge-type Seal onto the shaft, tighten mounting screws and that's all.



Cartridge-type Seal

Just as new engineering developments increase efficiency and performance, so can workers' efficiency be increased through the use of chewing gum. The act of chewing helps relieve nervous tension, thus helping to make the work go smoother and easier. That's why plant owners everywhere more and more are making Wrigley's Spearmint Chewing Gum available to all.

Complete information may be obtained from
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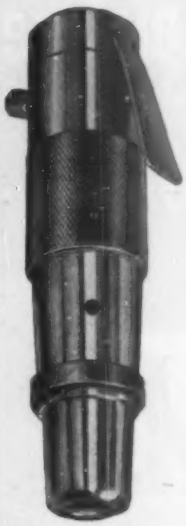
Pneumatic Hammer

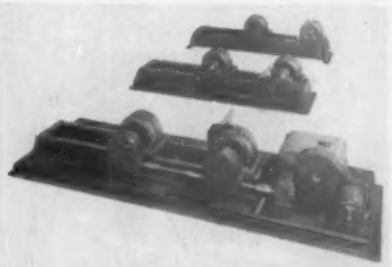


PNEUMATIC hammer makes 5,000 strokes per min at 100 psi air. Stroke ⅞ in.; bore ⅝ in.

A NEW utility air hammer, Model G, especially suitable for scaling and cleaning welds, is now on the market. It is also suited to chiseling, cutting, die work, chipping, ripping, tuck pointing and general maintenance work. The tool is 8-in. long and has a bore of ⅞ in. and a stroke of ⅜ in. It delivers about 5,000 strokes per minute on 100 psi air pressure.

A safety feature is the combination locking-type tool holder which eliminates the danger of tools flying out while the hammer is in use. Nine different chiseling, chipping, and drilling tools are available for the Model G. THE BORM MFG. CO., Elgin, Ill.

* * *



TURNING ROLL rotates tanks for automatic welding and positions work up to 12-ft diam for flame-cutting and painting

Turning Rolls

USED for rotating tanks and other cylindrical shapes for either manual or automatic welding, the Reed Model 120 turning roll can also be used as a tank positioner for flame-cutting, painting, etc. It consists of one power unit with two synchronized driving wheels and one or more idler units. Work up to 12 feet in diameter can be handled.

The capacity for one power and one idler unit is 12,000 lb; for one power unit and two idlers, 18,000 lb. Standard equipment includes ¾-hp motor, dual rubber-tired wheels, anti-friction bearings and enclosed worm-gear reduction drive. Variable-speed drive gives a welding speed of from 5 to 40 in. per minute. A reversing drum control and 30 feet of flexible control cable for remote operation are also included. The power units are 112 by 34 in. and measure 18 in. to top of wheels. The idlers are 78 by 24 in. and are the same height. THE REED ENGINEERING CO., 1003-17 West Fairview Ave. Carthage, Mo.

ATTACHMENT converts standard hand truck to portable cylinder carrier

Hand Truck Attachment

A NEW tilt truck attachment converts almost any two-wheeled hand truck into a three-wheeled, adjustable cart for transport of oxygen and acetylene cylinders. A telescoping tube, extending upward from the platform to the top crosspiece of the truck, is adjustable by fingertip control to tilt the cart and lock it any desired angle. A light chain may be looped around the cylinders to hold them securely.

To pick up a cylinder, the cart is tilted forward and the lip pushed under the cylinder. A slight pressure on the foot of the leverage plate, which extends over the third wheel of the attachment, is sufficient to "break over" the weight of the cylinder and load it on the cart. MELOOZ MFG. Co., 4730 Avalon Blvd., Los Angeles 11.

* * *

ENGINE-DRIVEN welder for job shops, repair shops, etc. has 180-amp output, operates six hours per fueling

Portable Welder

THIS 180-amp machine is known as the "Lincwelder" and is roughly 2 ft wide, 2 ft high, by 4 ft long, with a net weight of 502 lb.

Features are: output panel has three ranges of output current; continuous adjustment within these ranges is obtained by means of a speed control; cooling is through a fan mounted on the generator shaft; power is provided by an air-cooled two-cylinder engine. Mounting rails for bolting to floor or platform permit the welder to be mounted on either a shop trailer or a high-speed two-wheeled trailer. THE LINCOLN ELECTRIC Co., 12818 Coit Rd., Cleveland 1, Ohio.

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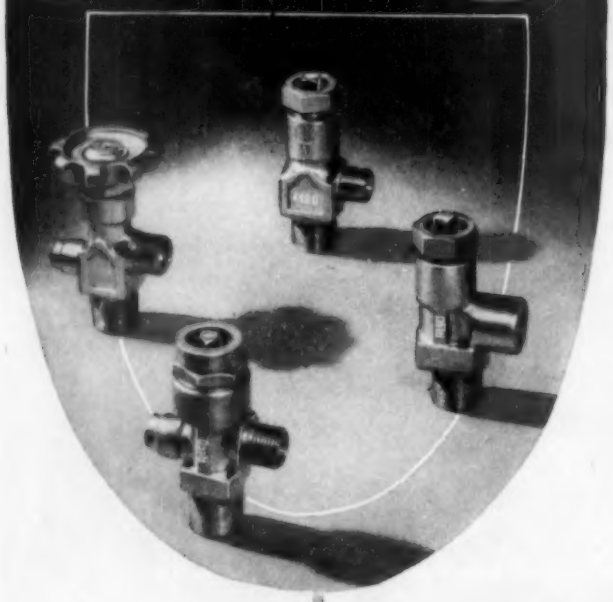

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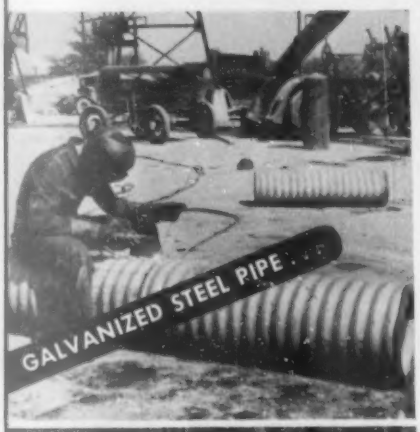

Speer Carbon Electrodes Give Stronger Welds at Low Cost!

Day after day, carbon arc welding proves itself in dozens of uses by giving hard, strong welds at low cost.

Speer Carbon Electrodes put top efficiency and economy into this versatile method. Greater current carrying capacity – even burning arc with high heat value – 33% longer life – 22% harder, are characteristics that combine to give you 13% more weld inches per electrode.

Get the economy and high efficiency that go with uniformly dense Speer Electrodes. Into the making of each one goes technical knowledge that has made Speer a leader in the welding field for 50 years.

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ANY TYPE
ANY GRADE

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MANGANAL

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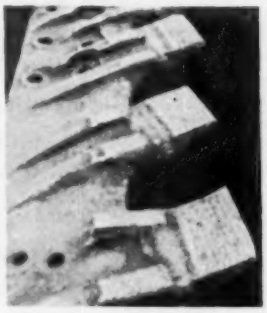
11% to 13½ % MANGANESE-NICKEL STEEL

WEDGE BARS



Regardless of the analysis of the parent metal Manganal 11% to 13½ % Manganese-Nickel Steel Wedge Bars can be used to do a more economical and more efficient job. Due to its high tensile strength, toughness and work hardening under impact and abrasion it will last longer. Manganal Bars come in 22 sizes to fit any tooth size. Try them once-you'll always use it!

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Hobbyist's Welder

A new low cost arc welder, the "Hobby Arc" has been designed for the home or small workshop. It delivers 100 amp and is available for either 110 volt or 220 volt a-c lines. It operates on a 30 amp fuse. Ruggedly constructed, its coils are wound with glass-covered magnet wire, and have silicon-steel cores.

Safety features are "dead front" construction and insulated transformer. The welder is shipped complete with 10 ft of welding cable, electrode holder, 10 ft of ground cable, welding helmet and assorted electrodes. The 110-volt model has power cord and plug attached, the 220-volt model a power cord only. The Miller Electric Mfg. Co., Appleton, Wis.

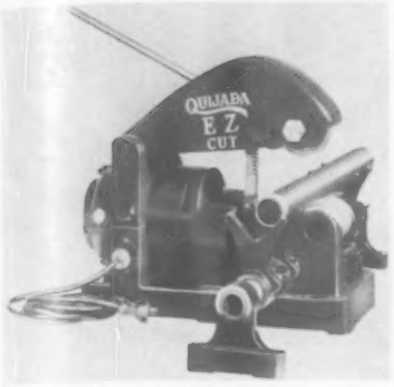
* * *

ADDITIONAL power units for spot welder extend range from 18 to 50 kva

Spot Welder

Waitcus spot welders, which feature an "Add-a-Unit" design for adding additional power units to the basic machine, are now in full production.

Range for these machines is equivalent to 18 kva to 50 kva. High d-c amperage with low voltage arrests heavy throat loss and helps to eliminate danger to operators. The welder is easily converted into a triple duty machine by inserting push or squeeze gun cables in standard horn castings. The Waitcus Mfg. Co., 642 South Clark St., Chicago 5.



STEEL PIPE up to 4-in. diameter may be cut with this automatic cutter

Pipe Cutter

POWER-DRIVEN rollers, automatic stop-start action and ball-bearing action are features of a high-speed pipe and tube cutter, "E-Z Cut." This portable machine will cut steel or cast-iron piping in diameters ranging from 3/8 to 4 in. The cutting wheel is removable for sharpening. Gears are self-lubricating and an automatic trip-switch starts cutting operations as soon as the cutter wheel contacts the pipe. Operation stops automatically upon completion of the cut. The adjustable roller yokes provide necessary support for the pipe, yet permit free rotation. Cutter is furnished with 10 ft of electric cord and a twist lock plug to motor. QUIJADA TOOL CO., INC., 5474 Alhambra Ave., Los Angeles 32.

* * *

TANDEM cylinder truck carries two 8-in.-diam cylinders, loaded separately

Cylinder Truck

A TANDEM cylinder truck for welding purposes, the Alweld KC-50, has recently been developed. It is all-welded and has a buggy-type handle. Two 8-in. diam cylinders, 41 in. high, are accommodated.

Either cylinder can be loaded or unloaded independently and both are cradled in place by the chain and "Locktite" safety hook. The truck is available with either 20-in. steel wheels, 5-in. solid rubber wheels or 10-in. ball-bearing (semipneumatic) rubber-tired wheels. THE WELDED TRUCK AND SPECIALTY CO., 1849 West Grand Ave., Chicago.

for dependable
PERFORMANCE

"FLUXINE" Fluxes are the result of over fifty years of scientific research into the metal-joining field. There are 89 FLUXINE Fluxes . . . one for every welding, silver soldering, brazing, and soft soldering operation . . . each with its own properties, designed for a particular metal-joining operation. All have been perfected not only for highest efficiency, speed, and long life, but for economy and safety as well. FLUXINE Fluxes produce no injurious fumes to irritate eyes or nose of the operator.

Write on your company letterhead for a generous sample stating which FLUXINE Flux you desire.

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No. 4 FLUXINE. in powder form, for welding cast iron with bronze rods.

No. 7 FLUXINE for welding all types of aluminum.

No. 18C FLUXINE for gas and atomic hydrogen welding of stainless steels and inconel.

No. 41 FLUXINE used with high-melting silver solders on copper and its alloys and on steel.

No. 42 FLUXINE used with Westinghouse Phos-Copper rods and low-melting silver solders on copper and its alloys.

No. 43 FLUXINE . . . non-glaring . . . used when low-melting silver solders are specified. No injurious fumes. Goes further than most fluxes.

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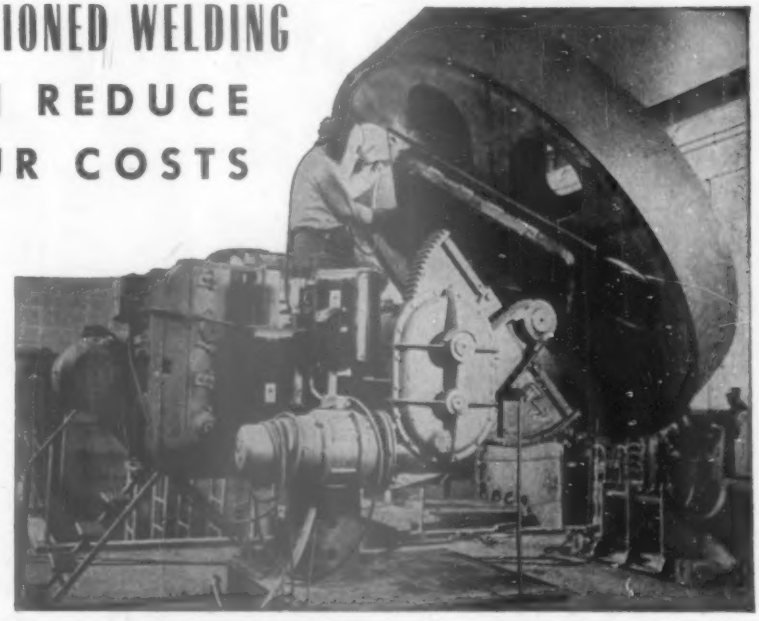
FLUXES TO JOIN ALL METALS

POSITIONED WELDING
CAN REDUCE
YOUR COSTS



Because C-F Welding Positioners make every weld a downhand weld, your welding time and cost is cut to a minimum. Positioned welding permits use of larger electrodes—fillets of correct width and depth can be laid in one pass, with resulting time and material saving PLUS better welding. C-F Positioners with Variable Speed table rotation in any range from 0 rpm and up provide greater flexibility of positioner use in all types of automatic or hand welding. Like all C-F Positioners, these power operated models tilt 135° from the horizontal and full 360° table rotation is possible at any angle.

Investigate the definite cost-saving advantages of C-F Power or Hand Operated Positioners. All models have either variable or constant speed control of table rotation. Write for Bulletin WP.

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O'FALLON, ILLINOIS

WELDER CONTROL operates from 115-volt circuit, supplies 3.5 to 63 watt seconds to bench-type spot welder

Spot Welder

RELEASE of a new model of the Freshman 200 microfarad "Condenser Weldpower" control and spot welder is announced. It is designed for precision welding in industries which manufacture radio tubes, jewelry, telephone and electrical equipment, etc. The electronically controlled welder is operated from a 115 volt lighting circuit. The level of energy delivered from the control is adjustable from 3.5 to 63 watt seconds.

This compact bench-welding outfit is suitable for metals of high thermal conductivity such as aluminum, copper and phosphor-bronze. To weld such metals without a high-capacity power source, a condenser is used to accumulate energy for each weld in the interval between welds. THE RAYTHEON MFG. CO. Waltham 54, Mass.

* * *

OPTIONAL HIGH FREQUENCY is featured in this a-c arc welder

A-C Welders

RECOMMENDED for heavy-duty industrial jobs are two "high-cycle" a-c arc welders of 200 and 300 amp output, respectively. Selective heat settings in one-amp steps are provided through the air-cooled induction-type transformer. A precision electrical circuit holds the arc constant, while the high-frequency circuit may be switched on with "feather touch" control to meet electronic fluxing and oxide dispersal requirements of the inert-gas-shielded arc process. MID-STATES EQUIPMENT CORP., 2429 So. Michigan, Chicago 16.

SHORT MOTION and slight angle of this foot switch eliminates fatigue

Foot Switch

ENCLOSED in a heavy cast case and gasketed for oil-tight applications is a heavy-duty foot switch operable from three directions. Short motion and slight angle of stroke minimize ankle fatigue.

Contact arrangements available are: single pole, double throw, double throw, double pole, double throw. There is also a two-stage type each stage being single pole, double throw. Two interchangeable covers are available—one with a pedal guard for protection against accidental operation and the other a plain cover for applications not involving hazard to the operator. SQUARE D Co., INDUSTRIAL CONTROLLER DIVISION, 4041 N. Richards St., Milwaukee 12.

* * *

STANDARDIZED guns are said to answer 95% of spot-welding requirements

Standardized Welding Guns

PROGRESSIVE WELDER Co., 3050 E. Outer Drive, Detroit, has developed a line with and constructed from interchangeable standardized parts. The line consists of five basic gun types, in heavy-duty versions, which are said to take care of 95% of all requirements. Basic standardized components are the chassis, "jaw extensions," interchangeable hydraulic or air operating cylinders, optional cable locations, handles, universal cable terminal clamps, switches, electrodes and electrode holders.

This standardization, Progressive claims, makes it possible to obtain as many as 57,600 practical variations with a single basic gun chassis by varying only the jaw extensions and standard electrodes.

Standard jaw extensions are available in 1-in. increments from 1 to 6 in.

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Carbide
EFFICIENT
ECONOMICAL
DEPENDABLE
for
Welding & Cutting
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High Strength
Machinable Welds
In Cast Iron . . .
EASIER . . . FASTER . . . CHEAPER

Talk about sound, strong, machinable welds in cast iron Here's a way to get 'em . . . *but fast* . . . every time. Use Ni-Rod* electrodes"

Ni-Rod's easy-to-control arc speeds up all kinds of cast-iron repair work. Cuts labor, time, and costs. Raises welders' success scores on tough jobs.

Ni-Rod gives you thorough fusion . . . close color match . . . smooth bead that sheds slag. Works on A.C. or D.C.

Stocked in 3/32", 1/8", 5/32" and 3/16" sizes. Order a 5-lb. package today.
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Milwaukee 4, 647 W. Virginia St.
Minneapolis 15, 529 S. 7th St.

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News of the Industry

George Sieger to Be Next AWS President

NOMINATING committee of the American Welding Society has proposed for 1948-1949 president G. N. Sieger, president and general manager, S.M.S. Corp., Detroit. Mr. Sieger is now first vice-president of the association. For first vice-president, the committee suggests O. B. J. Fraser, assistant manager, development and research division, The International Nickel Co., Inc., New York City, who is now AWS second vice-president. For the latter office, H. W. Pierce, assistant to the general manager, New York Shipbuilding Corp., Camden, N. J., has been nominated. Four directors at large have been proposed: J. J. Chyle, director of welding research, A. O. Smith Corp., Milwaukee; J. H. Humberstone, director of research and welding engineering, Arcrods Corp., Sparrows Pt., Md.; T. B. Jefferosn, editor, THE WELDING ENGINEER, Chicago and H. N. Simms, metallurgist, Black, Sivalls & Bryson Inc., Oklahoma City.

* * *

Next Metal Show at Philadelphia

30TH annual National Metal Congress and Exposition will be held in Philadelphia's Commercial Museum and Convention Halls for five days beginning Monday, Oct. 25, according to a recent announcement by W. H. Eisenman, national secretary of the American Society for Metals. As in past years, the annual Metal Show will again be sponsored by the ASM.

Meeting simultaneously with the ASM will be the American Welding Society, the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers and the Society for Non-Destructive Testing (formerly American Industrial Radium and X-Ray Society, Inc.)

This will be the fourth time that the Exposition has been held in Philadelphia; previous years being 1920, 1928 and 1941. The anticipated attendance is estimated at approximately 30,000 persons from industrial classifications.

* * *

Welding Supply Firm Changes Name

ADAMS MFG. AND SUPPLY CO., is the new name of the firm formerly known as Knoles Fabricating Co. (see article "Milk Tanks Welded From Stainless-Clad Steel." June, 1948, issue of THE WELDING ENGINEER). Headquarters are at 1522 N. Indiana St., Los Angeles 33.

Lewis B. Adams, part owner of the business, reports greatly increased facilities. Factory and office quarters are being enlarged to nearly twice former floor space. New machine tools and equipment are also being added. The company produces welding cylinder trucks and materials handling trucks. Improved hand truck types will also be added to the line. In accordance with the policy of distribution through welding supply jobbers, more distributors are being added throughout the country.

* * *

H. K. Work Named for ASM President

DR. HAROLD K. WORK, manager of research and development of the Jones and Laughlin Steel Corp., Pittsburgh, has been nominated for president of the American Society for Metals. He now is ASM national vice-president.

Dr. Arthur E. Focke, research metallurgist of the Diamond Chain and Mfg. Co., Indianapolis, was selected by the nominating committee for vice-president of the society. W. H. Eisenman was nominated for his 16th consecutive two-year term as national secretary. Dr. Harry Croft, director of technical control and research, Chase Brass and Copper Co., Cleveland, and Frederick J. Robbins, manager, Sierra Drawn Steel Corp., Los Angeles, were nominated for two-year terms as national trustees.

Dr. Work will succeed Francis B. Foley, Midvale Corp., Philadelphia, as ASM president.

* * *

Gas Manufacturers to Meet on Shipboard

EXECUTIVE board of the Compressed Gas Manufacturers' Association will hold its September meeting on board a steamship enroute from Montreal to Murray Bay, Canada, on the evening of Sept. 9. This meeting will be in conjunction with the annual meeting of the Canadian Section. A large number of reservations have been made for the unusual meeting place.

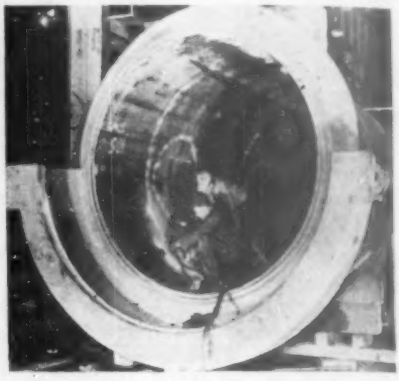
* * *

New Monel Roofing May Last a Century

A NEW type of Monel sheet for roofing purposes, estimated to last over a hundred years, has been developed by metallurgists of the Huntington Works of The International Nickel Co. The new sheet has all the mechanical and corrosion resistant properties of the roofing sheet previously produced at Huntington except that it is softer in temper and lends itself more easily to the various bending, forming, seaming and soldering operations required.

Available in standard roofing thicknesses, it is as adaptable to rural dwellings as it is to public and commercial buildings exposed to corrosive atmosphere and salt air. At present it is being used for skylight framework, penthouse sidings, through-wall flashings, cap and base flashings, gutters, cornices and downspouts as well as complete roofs.

* * *



MAGNETIC-PARTICLE inspection being performed on 220-ton welded pressure vessel built by Babcock & Wilcox for the Navy to test underwater equipment

220-Ton Pressure Vessel for Underwater Testing

NAVY underwater equipment tests will soon be carried on in a 220-ton pressure vessel being fabricated by The Babcock & Wilcox Co. at its Barberton, O., plant. This unusual test chamber has a 100-in. ID, and an overall length of 40 ft 6 in., and is made of 3 15/16-in. plate.

The main shell was formed of three courses, each 105 in. wide. The three curved courses together form a complete cylindrical section. Before the longitudinal seams could be welded, it was necessary to preheat each course in order to prevent cracking of the heavy welds. Each welded section was also stress relieved. Rear elliptical head and front locking ring were then lined up with the sections for placement of the four circumferential welded joints. While the entire chamber was held at preheat temperature, the huge shell was mounted on drum turners and rotated slowly under the automatic welding head to complete all girth welds.

Chamber is provided with four 12-in. diam inspection ports to allow for thick-glass sight openings. These unusual inserts were designed to permit complete X-ray examination of welds. Although the inside opening of the ports is only 12 in., the OD of their forgings was made 41½ in. to accommodate the bolting of retaining rings and provide proper reinforcement for the opening. Other miscellaneous nozzles and connections for filling and emptying the tank in operation were welded together with saddle supports. After welds had been completed, the shell section received stress relieving at 1,150 F.

Machinery and Welder Holds Third Open House

A WELL organized and enthusiastically attended open house was held Friday and Saturday, June 4-5 at the Chicago office of Machinery and Welder Corp. R. L. Kohlbry, district manager, reported that as many as 250 people at a time were in the building. Events ran continuously from 2 to 10 p.m. Friday and 10 a.m. to 10 p.m. Saturday. Overall registration ran around a thousand visitors.

Lavish refreshments, reminiscent of the old free lunch days, were served to all comers. The door prize of a table model radio was won by H. G. Carlson of Consolidated Welding and Engineering Co., Chicago. Other door prizes, baseball tickets, were won by R. Karstens of Western Springs, Ill.; J. Chandler of American Steel Foundries, Chicago; L. Ulrich of Barber-Greene Co. of Aurora, Ill.; and N. Leinweber of Leinweber's Welding Service, Washington, Ill.

Two color films, "Arc-Welding at Work" and "This is Resistance Welding," both produced by General Electric, were shown to audiences at half hour intervals.

Model WD-40 General Electric welders and recent developments in 6012-6010 electrodes were demonstrated by company personnel.

Printed folders with candid camera shots of the participants in the open house were sent to those attending the show and to the company mailing list. Previously, the Milwaukee office of Machinery and Welder had held a similar show in April and the St. Louis office in May.

* * *

Air Filter Corp. Moves Offices

AIR FILTER CORP., manufacturer of "Aircor" welder filters, has recently moved into larger quarters at 108 North Water St., Milwaukee 2.

* * *

Photologue Moves to New Location

PHOTOLOGUE PUBLISHING CO., compiler and printer of welding catalogs, moved recently to new and larger quarters at 600 West Jackson Blvd., Chicago 6. The company plans to expand its personnel to give better service to customers.

* * *

Stevens Institute Opens Department of Metallurgy

A DEPARTMENT of metallurgy recently established at Stevens Institute of Technology, will take over work in the metallurgical field now being carried on by the department of chemistry. It will have an initial staff of six. Dr. Alfred Bornemann, formerly associate professor of chemistry, becomes professor of metallurgy and will head the department. Theodore Gela will serve as assistant professor.

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piping hot
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WELDOLET
Eliminates costly pipe threading, provides full strength at joint and full flow.

Mounting wage levels emphasize the importance of increased man-hour productivity . . . and the kind of savings achieved by Welding Shipyards, Inc., of Norfolk, Va., with the unique WeldOlet Fittings.

You'll find WeldOlets* and ThreadOlets* on all water and steam lines on the tankers and aircraft carriers built or reconverted by this concern . . . even with hot water pressures up to 225 P.S.I. at 220° and steam pressures up to 300 P.S.I. at 500°.

The ease of installation of WeldOlets* and ThreadOlets* cut finished job costs by as much as 50%. Better flow conditions are attained, because the funnel-shaped inlet of the fitting improves hydraulic efficiency by minimizing turbulence and friction. Weld metal and slag are easily removed.

WeldOlet Fittings can be welded to pipes wherever outlets are required. They are safe, efficient, easily installed.

Write today for our handbook. It may suggest ways in which WeldOlet Fittings can cut your costs. There is a distributor in every principal city.

BONNEY FORGE & TOOL WORKS
Forged Fittings Division, 354 Green Street
ALLENTOWN, PENNA.
MANUFACTURERS OF FAMOUS BONNEY TOOLS

YOU GET 7 IMPORTANT ADVANTAGES WITH WELDOLETS* . . .

1. Full pipe strength
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WELDOLETS
*Trade Mark Reg. U.S. Pat. Off. Pat. in U.S. & Foreign Countries
FOR WELDED BRANCH PIPE OUTLETS
When you want Bonney Welding Outlets, ask for WeldOlets*

Fuse-Well Cast Welding Rods

THE STANDARD OF QUALITY THROUGHOUT THE WORLD

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OF STANDARD ANALYSIS
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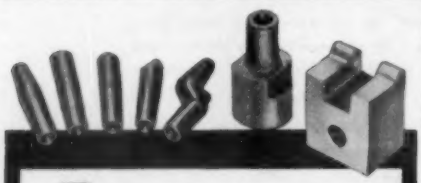

THESE nine superior alloys are made to exacting specifications, and conform to the standards of the Resistance Welder Manufacturers Association, to give you a maximum of service at the lowest possible cost.

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RESISTANCE WELDING ALLOYS

TIPS • FORGINGS • DIES
BAR STOCK • CASTINGS
SEAM WELDER WHEELS
TUBE MILL WHEELS

Write for Tuffaloy bulletin. It gives you the latest RWMA standards and recommendations, and shows how well the Tuffaloys fit in to take care of all your resistance welding needs.

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HOLD PARTS PERFECTLY FOR EASIER, FASTER WELDING WITH

Simplex
UTIL-A-TOOL

clamps, pulls, pushes, spreads, bends or lifts

The Simplex Util-A-Tool pulls together, clamps and holds parts of all sizes and shapes. Easy to use and powerful, it saves time and work. Handy, too, as a jack, as a puller or for pressing. Set includes Util-A-Tool, sky hooks, 3-way base, spreader jack, chains and lever bar.

Simplex LEVER · SCREW · HYDRAULIC Jacks

SEND FOR BULLETIN P & P 48

TEMPLETON, KENLY & CO.
1000 S. Central Ave., Chicago 44, Ill.

New Steel Pipe Plant in Utah

A $1,000,000 steel pipe plant will be constructed in Salt Lake City by Structural Steel & Forge Co., a division of Eimco Corp., in association with L. J. Berkeley, owner and president of the Penn Tool & Machine Co., Danville, Ill. Mr. Berkeley is the inventor of much of the continuous pipe-welding equipment that will be installed. The plant, which will employ about 150 men, will produce pipe in sizes from 10 to 36 in. for water, oil, gas and sewage lines, water-well casing and oil-well casing.

Morris Rosenblatt, president of Structural Steel and vice-president of Eimco, predicts an ample market for steel pipe production in the intermountain states, pointing to the present large demand arising from municipal water and sewer line installations and replacements, oil developments in the Rangely field and extensive oil explorations. The new plant will rely on Geneva Steel Co.'s Utah plant for its steel supply.

* * *

Superweld Organized for Furnace Brazing

SUPERWELD Corp., Los Angeles, has been organized with a capitalization of $500,000, to engage in the copper brazing of steel, silver brazing, bright annealing and in the manufacture of specialized metal products. Superweld also plans to manufacture a line of new products of its own design, which will be marketed throughout the country.

Walter T. Wells, chairman of the board of directors, and one of the founders of the Lane-Wells Co., Los Angeles, has been elected president and general manager. Others officers include Robert E. Jones, formerly with the Ray Control Division, vice-president, and C. B. Lansdown, formerly assistant treasurer of Warner Mfg. Co., secretary-treasurer. Harold C. Hill of the General Electric Co., Los Angeles, and Willam M. West of West & Co., specialists in hardware, are also directors.

Superweld Corp. has purchased all furnaces and brazing equipment of Warner Mfg. Co., Glendale, Calif. (see article "E. F. B.," page 40, THE WELDING ENGINEER, April, 1948) and leased a building with an area of 17,000 sq ft plus additional land for parking and loading facilities at 708 Hawthorne St., Glendale.

The electric furnaces are said to be the most modern and largest available for custom brazing west of Detroit. The equipment includes a degreasing machine and other auxiliary apparatus.

* * *

Welding Equipment Shop Commences Operation

JOHNSON WELDING EQUIPMENT CO., INC., 2640 West Van Buren St., Chicago 12, recently completed installation of a new service shop to repair welding and cutting equipment for customers throughout the Chicago area.

Free Electrode Samples Offered to Industry

SAMPLES of "Ni-Rod," a welding electrode for making machinable welds in cast iron, are being offered to industry by The International Nickel Co., Inc. These samples are available in 1/8, 5/32 and 3/16 in. diameters.

* * *

Barges Cut in Half for Arabian Shipment

SIX 150-TON steel barges were recently cut in half at Everett-Pacific Shipyard, Everett, Wash., for transit by cargo ship to Saudi-Arabia. Cutting of each barge, using flame-cutting equipment, took about 36 hours.

Each barge was 104 ft long, 29 ft wide and 8 ft deep inside. It was cut amidships, next to a bulkhead. After cutting, another bulkhead of mild ½-in. steel was welded to the cut-off half. The halves will be assembled in Arabia by bolting and welding. Bolting will be at channel irons just under the top deck. After proper alignment has been secured, the two sections will be welded together by strip welding at stiffeners, plus fillet welding. Re-welded barges will serve as lighters for the Arabian-American Oil Co.

* * *

New Distributor Incorporated in Dayton

EMERSON L. HORNER, Vera Breesman and Barry L. Shillito are incorporators for a new welding distributor firm, the Harris-Lincoln Supply Co., Dayton, O. This company will engage in the sale and service of welding equipment.

* * *

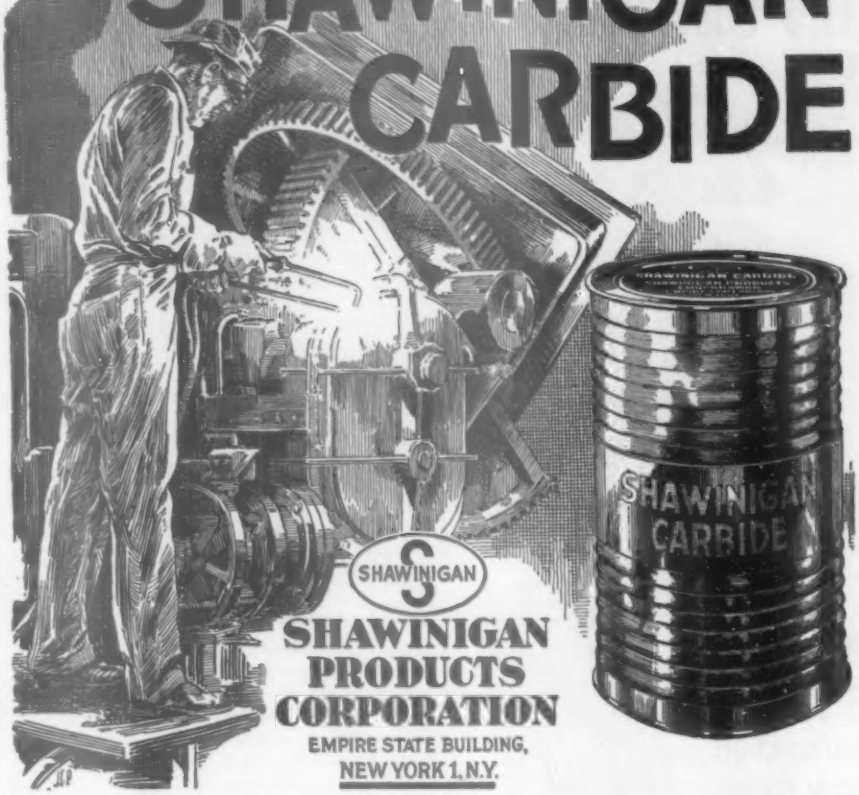
New Ohio Firm Enters Welding Coating Field

ROXALOID CORP., Akron, O., has been incorporated to deal in welding materials and plastics. Incorporators are Charles R. Iden, Betty J. Sondles and Phyllis Rubins.

"Burns quickly, doesn't it."

Master Hands on Intricate Jobs use

SHAWINIGAN CARBIDE



SHAWINIGAN PRODUCTS CORPORATION
EMPIRE STATE BUILDING,
NEW YORK 1, N.Y.

Photo Courtesy Peerless Welding Co., St. Louis, Mo.

✓ THE MECO CIRCLE MIXER—Correctly proportions welding gases for maximum efficiency and superior results without creating the least resistance to their flow.

✓ SPRING TENSION NEEDLE VALVES—Insure permanent adjustment at any point. Adjustments can be accurately made and held in place regardless of bumping or jarring of welding handle.

✓ ARMORED GASKET TYPE JOINT—Provides a leak-proof seal between torch handle and mixing chamber, or torch handle and cutting attachment—minimizes wear.

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HANDY METAL CASE WITH

DRILL SIZES ENGRAVED ON BACK

Separation between serrations an exclusive Thermo identifying feature.

Saves more tips, more man hours and insures greater efficiency. The only tip cleaner with uniformly rounded, non-scratching cleaning ridges, manufactured through an exclusive Thermo process.

Standard set of 12 cleans 27 drill sizes. Large size set of 9 cleans 19 drill sizes.

THERMACOTE CO.

Newark, N. J. — Chicago, Ill.

Los Angeles, Cal. — Portland, Ore.

First Russian Use of Welded Blast Furnaces

The first all-welded blast furnaces are being erected in the Soviet Union. Workers engaged in rehabilitating the "Zaporozhyestal" steel works near the Dnieper power plant, are using arc-welding instead of riveting in the erection of large modern blast furnaces.

Following a two-month training course in welding heavy armor plate, twelve weldors did the job of welding the blast furnace housing on furnace No. 4 with high-tensile electrodes. The entire housing as well as the armor of the furnace was completed ten days ahead of schedule.

A special process for welding blast furnaces was developed and followed in the erection work. Preassembled on the ground in large block units, the furnace steel housing was hoisted by crane into place, and welded unit by unit in position. Welded seams were immediately cleaned and peened.

—McGraw-Hill World News

* * *

Arcos Corp. Consolidates Philadelphia Facilities

In an effort to co-ordinate all its activities in one building, Arcos Corp., manufacturer of stainless and alloy electrodes, has moved its general offices to 50th Street and Paschall Ave., Philadelphia 43. This location is within a few minutes of downtown Philadelphia and offers ample parking space for visitors.

* * *

Ampco Appoints New Licensee

Bay State Bronze and Aluminum Co., 191 So. Main St., East Longneck, Mass., has been authorized by Ampco Metal Co. to produce castings from Ampco metal ingot.

* * *

Ohio Firm to Enter Commercial Welding Field

Planning to enter the commercial welding field, Canton Elevator & Mfg. Co., Canton, O., manufacturer of industrial and commercial freight elevators, dumb waiters and domestic passenger elevators, has purchased three buildings where it will concentrate all activities.

* * *

Reynolds Enlarges Service to Machinery Builders

Reynolds Metals Company's intensive program to develop new uses for aluminum in industrial machinery has resulted in such an increasing interest in aluminum that the company is enlarging its development and sales service facilities. An excellent example of the use of extruded aluminum shapes is provided by textile machinery, where the light metal has proved particularly advantageous because moving parts have less mass and consequently less inertia.

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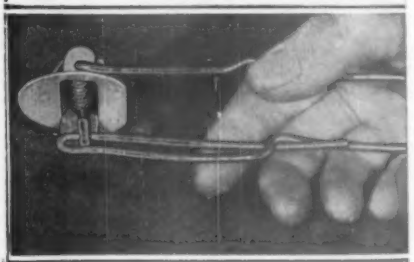

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Unrivalled economy is provided by the many superior, exclusive design and construction features of the Improved "Round File" lighter. A large file area is provided—approximately one square inch. The file is of superior quality, hardened in our own factory. The spark metal is of large diameter and the patented cartridge holding the metal locks exactly into position, permitting instant replacement. Every part of the lighter is thoroughly tested.

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The Technical Slant

Corrosion

CORROSION HANDBOOK. Edited by Herbert H. Uhlig. Published by John Wiley and Sons, Inc., New York City, 1948. Cloth, 6 x 9 in.; 1,221 pages. Price $12.

Keenly aware of the tremendous national expense caused by the corrosion of metals, The Electrochemical Society in 1942 created an organization within itself known as the Corrosion Division. One of the first objectives was to sponsor a handbook in which could be brought together the vast amount of information scattered throughout scientific and engineering literature. As editor, Dr. Uhlig successfully correlated the efforts of 102 scientists and engineers.

The *Corrosion Handbook* stresses quantitative knowledge rather than qualitative. The rates of corrosion have been listed under precisely defined exposure conditions, allowing the reader more adequate basis for a sound judgment. In expressing these rates, most data have been transposed to inches penetration per year (ipy) or milligrams per square decimeter per day (mdd). These units, convertible from English to metric systems and vice versa, have become standardized terms that are already in widespread use. Corrosion rates, however, do not necessarily imply a total time of exposure in years or days, Dr. Uhlig explains. Rather, these rates are used in much the same way we use miles per hour—that is to determine an average speed.

* * *

Fracture

THE FRACTURE OF METALS. Published by the American Welding Society, New York City, 1947. Paper, 6 x 9 in.; 58 pages. Price $1.

This published report to the Bureau of Ships, U. S. Navy, provides a means for engineers and designers to approach the problem of fracture intelligently. The report is a simultaneous summary of reviews of the literature and direct interviews with outstanding men in the field. In addition to the extensive bibliography of approximately 300 references, a recommended research program is outlined.

* * *

Storage Tanks

STANDARD RULES FOR FIELD WELDING OF STEEL STORAGE TANKS. Published by the American Welding Society, New York City, 1947. Paper, 6 x 9 in.; 19 pages. Price 50 cents.

The 1947 *Standard Rules for Field Welding of Steel Storage Tanks* present the standard requirements for arc-welded and gas-welded construction of bulk storage tanks designed to hold liquids at substantially atmospheric pressure. The new edition contains revised materials standards and makes provision for welding plate of thicknesses up to 2 in. Revisions have also been made in the requirements for inspecting shell joints by sectioning methods.

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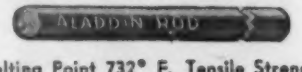

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About People

LUKE E. SAWYER has been elected executive vice-president and a director of the Babcock & Wilcox Co. and takes over the major management responsibilities. ALFRED IDDLES, president of The Babcock & Wilcox Co., has been elected president of the tube company to succeed the late PETER D. WHITE.

* * *

ALLAN W. WALTER has been appointed financial vice-president of the Liquid Carbonic Corp. He will make his headquarters in Chicago.

* * *

R. J. KILMER of Oberlin, O., has been appointed controller of Morton-Gregory Corp. R. C. FRIEDLY of Lakewood, O., has been named as assistant general sales manager of the Nelson Stud Welding Division of Morton-Gregory. FRED J. MEYER, Toledo, heretofore manager of Nelson's Railroad Division becomes assistant to the general sales manager.

* * *

J. L. STANFORD, formerly advertising and sales promotion manager for the automotive division of Thomas A. Edison, Inc., has accepted the position as head of Square D Company's switch & panel division, advertising section.

* * *

Two major changes in the operating personnel of National Tube Co. include RALPH M. OVERTON as vice-president of operations and T. H. KENNEDY as general superintendent of the company's works at McKeesport, Pa., succeeding EDMUND G. PRICE.

* * *

Died

L. R. CARTIER, 48, president of Independent Engineering Co., O'Fallon, Ill., died at his home on June 29th. He was the founder of the Independent Engineering Co., and the inventor of a number of improvements in oxygen, helium, and acetylene gas manufacturing. An active member of the Compressed Gas Manufacturers Association, he also served on the board of directors of several industrial gas companies.

* * *

JOHN D. TEBBEN, on July 1 became vice-president in charge of sales of the S-M-S Corp., Detroit. Mr. Tebben came to S-M-S from H. A. Wilson Co., where he was general manager. He is a past chairman of the Detroit Section, American Welding Society, and has been a member of numerous committees dealing with resistance welding problems.

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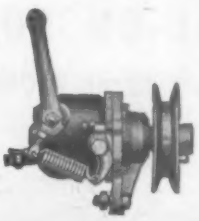

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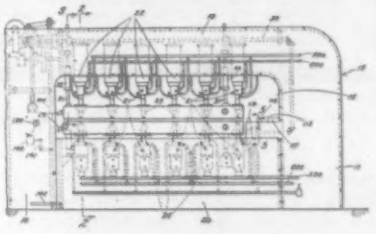
From the Patent Office

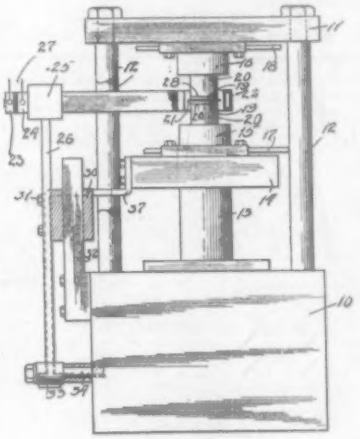


Multiple Spot Welding

2,439,233. Frank B. Yingling, Hamilton, O. Filed April 14, 1944. Issued April 6, 1948.

This multiple unit has opposed electrodes, work cooling clamp plates, means yieldingly mounting the plates for floating supporting sheets to be welded within the field of operation of the electrodes. Plates having coinciding apertures for the passage of electrodes to the work and means for actuating the electrodes.

* * *



Gas Pressure Welding

2,439,246. Emil F. Gibian, Cleveland Heights, O., assigned to Thompson Products, Inc. Filed Mar. 11, 1944. Issued April 6, 1948.

A pressure welding machine having a base supporting a top structure from which is suspended a fixed anvil. Another anvil in the base is so aligned with the top anvil to receive a stack of metal parts to be welded. The welding head has an aperture adapted to receive the parts and there are means provided to carry the welding head between anvils. The movable anvil engages one portion of a lever to raise and lower the lever in accordance with raising and lowering of the movable anvil. Welding head is raised and lowered with the movable anvil but at a lesser rate to maintain it at constant levels relative to the varying levels of the weld line of stacked parts.

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